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It is given out on apparently excellent authority that the railways between Chicago and New York have reached an informal agreement with the principal western meat packers to make a general increase averaging 11 per cent. in the rates on dressed beef and other eastbound packing house products. This is said to be the result of a conference which was held in Chicago last week, at which 29 representatives of the two interests took up the subject in a spirit of conciliation. The principal conciliator was George W. Perkins, of the firm of J. P. Morgan & Company. This firm obviously is well situated to act as an intermediary in dealing with a question like this, representing, as it does, large interests both in the railway and in the industrial fields. The more optimistic observers say that this agreement with the packing interests—which have been the principals in some of the fiercest fights with the railways—will be followed by similar conferences with large shippers of lumber, steel products and other commodities, and with equally hopeful results.

We shall publish next week in pamphlet form the United States laws relating to railways engaged in interstate commerce. It will have marginal indexes, for easy reference, and will consist of the Interstate Commerce Act, as amended by the law passed last week, the acts relating to testimony before the Interstate Commerce Commission, and to immunity of witnesses; the expediting act, the anti-trust law of 1890, the safety appliance acts and the employers' liability act and the laws relating to accidents, to hours of service, to block signals, to ash pans and to arbitration. It is the intention to include in one pamphlet the laws needed for reference by the railway officer. The pamphlet will be for sale at the offices of the *Railway Age Gazette.*

Concrete reinforcement bar specifications for concrete have been adopted by the Association of American Steel Manufacturers. They are printed in full in another column. The chemical qualities of the steel are in accordance with the recommendations of the American Society for Testing Materials for structural steel adopted in 1909. There is a greater range in the tensile strength and the yield point is fixed definitely, instead of being one-half the ultimate tensile strength, as in the specifications mentioned. The cold bend without fracture, it will be noticed, depends upon the grade of steel and also varies with the plain bars and the deformed bars. The general distribution of these specifications will help designers in reinforced concrete work, but the manufacturers might have gone one step further and made some distinction between rounds and squares. It has happened a number of times that specifications have called for rods of a certain size, to be spaced at certain intervals, and the area has not been given, nor the percentage of steel used and the contractor has no information as to the fiber stresses in the materials. The designer meant square bars, but because of the use of the word "rods" the contractor purchased rounds. Such things happen and often result in owners having to pay contractors extra. Dictionaries are not definite as to whether a rod may be round or square. Some engineers say "rod" when rounds are meant and "bar" when squares are meant. We need a learned society jury on this.

We publish elsewhere an article on the very interesting controversy over the terminal problem at St. Louis, which has been going on for about five years, and yet does not now seem as near an end as it did two or three years ago. There was reason five years ago for public sentiment at St. Louis against the eastern railways and the Terminal Railroad Association of St. Louis; they had not given St. Louis a "square deal." But, as the article referred to clearly shows, the railways have since done everything for St. Louis that reasonably could be asked of them. Meantime, the demands on them constantly have grown greater; and each concession they have made to the city has promptly been followed by additional exactions. In such bad faith have the municipal assembly and those shippers and real estate dealers who have been fighting the Terminal acted, that there is good reason for suspecting that if it and the trunk line railways acceded to all the demands at present made of them, the Terminal would again be denied the ordinances under discussion. These ordinances, according to the city's own Bridge and Terminals Commission, ought long since to have been passed, not merely in justice to the Terminal Railroad Association and the roads using the terminals, but even more in the interest of the industry and commerce of St. Louis. It is a strange situation when public service corporations are denied the opportunity

to confer benefits on a community except on condition that they will submit to plain injustice and oppression. The public will hardly get good and adequate service by making it to the interest of public service corporations *not* to give it.

Is the popular hostility to railways egged on by the politicians at Washington and at the state capitals, at last succeeding in intimidating the mechanical associations of this country, the greatest organizations of the kind in the world, into a policy of silence? Reading back in the records of past conventions we find the free communings of the members among themselves; the outpourings of their very hearts as they aired their troubles and expressed themselves as to the safety of any device that came up for discussion. The lid was off, the pot bubbled over, to the great edification of all concerned. The bubbling largely built up the associations and gave them a record the like of which no others of like kind can boast. Men looked to them for instruction, inspiration and guidance and got all. But slowly an insidious element of fear has been creeping in. The speakers at the recent conventions at Atlantic City seemed constantly to have in mind the question, whether any thing they might say could be so distorted that it would serve as a pretext for further legislation imposing additional restrictions and burdens on the railways, or could be used in the courts against them as evidence. Is it safe to speak at all? All this, whether warranted or not, is having its baneful effect and though there is probably no danger of the tendency running to a fatal extreme it cannot fail to have an influence in retarding progress. The associations cannot be criticized for their caution, much as it is to be regretted, for there is ample reason for it, and it will probably continue until sane regulation shall take the place of the baiting to which the railways have been subjected for the past few years.

The principal thing to be said about the amendments to the Interstate Commerce law, which Congress has given to the country after its six months' travail, is that the main results are all in the dim (but not very distant) future. It would be quite possible to exercise the power to suspend increases of rates in a way to do little harm, but as the commission is bound to please its creators, the people, we may expect that only after careful deliberation and gathering of proofs, which means delay, will it venture to approve any increase, and then only to the most moderate degree. In whatever way the power may be exercised there can be little doubt that it will in the long run tend to petrify the rate fabric of the country. The natural course of the railway traffic manager will be to risk no reductions and to place his main dependence on the slow improvement that comes from the growth of the country. But if he fails to make reductions in rates to develop his territory the commission will try to take up the task in his place—seven commissioners with no responsibility to do the work of a hundred freight managers who are hired to make the business of their roads pay. The commission will no doubt make a brave trial at moderation, and few observers will agree with President Ripley, of the Atchison, Topeka & Santa Fe, that state ownership will come in ten years, but there is no denying the tendency. The stiffening of the long and short haul section will affect mainly the territory west of the Missouri river. This change alone will make a great mass of work for the commission and with probably no useful result; for a commission with the wisdom of Solomon could settle the rival claims in this field only by an arbitrary compromise, transferring a burden from one community to another and satisfying no one. The special commission to inquire into the propriety of federal regulation of railway capital can do little but study, for it has no power to call witnesses; but in view of the magnitude and the perplexities of its question and the strong "state's rights" feeling in many states there would seem to be a fair prospect that the result of this section of the law will be innocuous, especially as its only purpose was to get a difficult question out of the way.

President Taft's friends loudly proclaim the new law as his "victory," but it can be called so only from a narrow party standpoint. He had to please the insurgents by giving up his most practicable and useful proposal, that to permit traffic agreements between competing lines (which would put a stop to the constant stultification now imposed by the contradictory requirements of the laws) and he had to let them add the revolutionary provision for suspending rate increases. They dropped the physical valuation idea voluntarily, as they saw that it might hinder instead of promote railway baiting. The President got his special court, but it will be a year or two before anyone can tell whether it will be worth a tithe of what it will cost. The thing most needed is not more hair-splitting study of legal precedents in the musty volumes of the law, but more opportunity for the exercise of common sense in the primary stages of rate making. Suppose, for example, the commission should follow English precedent and refuse to justify an increase in a freight rate unless the carrier could prove an increase in the cost of transporting the particular commodity to which the increase applied. On that basis progress would be blocked at almost every step, and yet there is the time-honored precedent. On the other hand, the commission could appoint a committee of two members who, as matters stand to-day, would see the reasonableness of generally justifying the principle of increased rates after a conference of half a day with two public spirited railway officers. And how is it possible to go beyond broad principles with, perhaps, an estimate of the percentage which will probably be justifiable? To technically justify particular increases beforehand will, in many cases, be impossible, even though the necessity of making them is obvious, unless the advances are made an inch at a time. And, at best, there is still the problem of bringing seven million rate questions within the capacity of seven men working perhaps seven hours a day.

THE RAILWAYS OF THE WORLD.

The *Archivfür Eisenbahnwesen* again publishes statistics of the railways of the world, bringing them down to the end of 1908, or the nearest date of official reports, which for this country and Canada is June 30 of that year. The data given are the mileage for each country for each of the five years ending with 1908, the increase for the last four years and the proportion of railway mileage to area and population. A further but less complete table gives the capital invested in each country and the amount of it per mile.

The grand total for the world is 611,478 miles, which is an increase of 61,505 miles, or 11.2 per cent., since 1904, and of 16,445 miles (2.8 per cent.) over 1907—which seems moderate progress when we remember that 13,000 miles have been built in this country in a single year. But it is fully up to the progress of recent years, the mileage opened in the world in each of the last five years having been:

1904.	1905.	1906.	1907.	1908.
16,508	13,039	17,394	14,627	16,445

which is a reasonably rapid progress, with no greater fluctuations than there have been in other industries.

The distribution of railways at the end of 1908 was as follows:

	Miles.		Miles.
Europe	202,109	North America	274,372
Asia	58,813	South America	39,013
Africa	19,211	Australasia	17,960
Old world	280,133	New world	331,345

Thus North America alone nearly equals in mileage the whole of the Old World. In the division between North and South America, the West Indies, which together have 3,340 miles, are counted with South America.

Of the increase of 61,505 miles since 1904 considerably more than half was in America (33,690 miles), and of this 27,115 miles was in North America, against 12,265 miles in Europe, 10,830 in Asia, 3,574 in Africa and 1,147 in Australia, with which the 89 miles on the Hawaiian Islands are counted. Of all the new countries of the world Australia is most backward in railway construction.

As for a few years past, the most notable fact in this matter is the building of railways in Asia and Africa, where the mileage in each has increased nearly 23 per cent. within four years—proportionately faster than in any other quarter of the globe. In Africa the lines are chiefly built for the traffic of mines, etc., developed by Europeans, not at all for the natives; and unless there should be an unlooked for occupation of the country by European settlers there is little prospect of a long continuance of this construction, though the mileage of Africa (outside of Algiers, Egypt and South Africa, still insignificant) may well be doubled within a few years. But the case is different in Asia, and especially in China, where a vast fertile country and a still vaster industrious population are in sore need of better means of transportation, and now at last really d esire railways, which, sooner or later, we may be sure they will get. It will surprise most to find that at the end of 1908 China had very nearly as much railway as Japan (4,998 miles against 5,035), and its mileage has increased as follows for the four years ending with 1908:

1904.	1905.	1906.	1907.	1908.
1,228	2,247	3,700	4,163	4,998

This is still very little for a population which counts by the hundreds of millions, but it is a good start, and it will be natural to expect that soon and for a long time China will be the chief field for railway construction.

More than half of the Asiatic mileage is still in India, where additions are made on a moderate scale, but without interruption.

In Europe perhaps the most notable change in 1908 is the very small amount built in Russia, only 285 miles, while of all European countries it needs new lines the most. It has still 102 miles less than Germany, which has little more than half its population and only one-tenth of its area.

In South America the chief progress has been made since 1907 by Cuba (573 miles=32 per cent.), Brazil (1,224 miles=11⅛ per cent.) and Argentina (1,800 miles=13 per cent). Of the 4,102 miles opened in South America in 1908 3,597 were in these three countries.

The statistics of capital show that 176,905 miles of railway in Europe are represented by $21,459,270,000, which is very nearly as much as the capital of 335,286 miles in other countries, making approximate averages of $121,393 per mile in Europe and $65,100 for the rest of the world. This applied to mileage whose capital is not reported would make the total capital invested in railways in the world $51,184,000,000, not including street and electric lines and the like.

THE GLADBROOK DISASTER OF MARCH 21.

The railroad commissioners of Iowa have made to the governor of the state a report on the disastrous derailment of March 21 on the Chicago Great Western between Green Mountain and Gladbrook, when 44 persons were killed, and they conclude that the cause was soft roadbed and excessive speed; but they print no adequate testimony to support the finding. A perusal of the report leaves the reader with a strong impression that the roadbed was soft, and, in the absence of evidence of any other cause, he is inclined to agree with the conclusion of the commissioners; but they are positive in the conclusion that the speed of the train was not over 25 miles an hour, and railway men will not agree with them that that rate of speed was excessive, solely because the engines were running tender first. The commissioners find that on railways generally the limit of speed for engines running backward is 25 miles, but they say that this limit should be much lower.

The main facts of this derailment were reported in the *Railway Age Gazette*, March 25, page 841, and April 22, page 1,041, and will be recalled by the reader. The principal additional facts brought out in the present report are as follows: The engines weighed 76 tons each. The pilotman was a conductor of the road and familiar with the track. He was fatally injured. The accident occurred on a straight line in clear weather. The engines might have been turned at Marshalltown so as to run head first. This implies an error of judgment on the part of the man who decided to run them backward. Engines as long and as heavy as these have been turned on that table. This train had two orders to run slowly on certain parts of the track, but these had no reference to the point where this derailment occurred. This point was at the far end of a cut about 5 ft. deep and 1,500 ft. long. The bottom of the cut was yellow clay. Water was standing in the ditches at both sides of the track and its surface was about level with the bottoms of the ties. This would seem to indicate that the line of the road at this point was level or nearly so, but the first report of the accident said that it occurred at the top of a slight grade. The rails are 75 lb., and the ties, mostly oak, were found to be sound. There were 23 ties to each 33-ft. rail. The superintendent had inspected the road a few days before and the track walker had been over it twice within 24 hours. The track is in poor condition for over 40 miles. This statement seems to have been based mainly on two facts; a rather large proportion of ties needing renewal and poor or deficient ballast; but nothing is said as to the kind, quantity or quality of the ballast, which perhaps means that there was none at all. It is stated that trains had constantly been running over the road with safety; but as to the speed of these trains or the weights of their engines the report is silent. The derailed engine ran 237 ft. after it left the track. On both derailed engines the throttles were found open and the brakes not applied. There was no evidence of any broken rail. One brake-beam on the leading tender was found down, apparently because of the breakage of one of the castings supporting it, but this break showed a bright fracture and there is no evidence that it occurred before the derailment. It is said that the ties on one side had been forced down into the mud, but the reader is left in doubt as to whether this occurred before or after the wheels of the tender (or engine) had left the rails. In their summary of conclusions the commissioners say that the track "was in a dangerous condition; it lay on a bed of clay which was wet and springy on account of improper drainage."

A report like this suggests forcibly the need of competent government investigators of railway accidents. Congress acted none too soon in passing the bill giving power to the Interstate Commerce Commission in this matter. Both of the roads involved in this disaster—the train belonged to the Rock Island—reported the cause as undiscovered. Where the derailment of a train at moderate speed results in killing two score passengers, reports of that character and brevity are very unsatisfactory, not to say exasperating. And for three commissioners, none of them engineers, to report that the source of the trouble was a soft roadbed combined with excessive speed and to express themselves in such vague language —not to mention a number of absurd conclusions which we have omitted from our abstract of their report—is equally regrettable. With a tender properly built and loaded, a speed of 25 miles an hour on good track cannot be called unsafe. If this tender was of unsuitable design or was not properly loaded, the public wants the evidence of the fact. On track sufficiently poor, a tender, safe in itself, could easily run off the rails, of course. If this was the trouble at Gladbrook the specific evidence of the badness of the track should be set forth; the depth of the ballast, the condition of the ballast or roadbed, as compared with other parts of the track and with safe track; the views of roadmasters and engineers on doubt-

ful points, etc. Again, if there was fault or probable fault in either the track or the tender, the qualifications of the pilotman should have been inquired into. He was a conductor, familiar with the road, but whether or not he was as well qualified as an engineman would have been in the matter of moderating speed for bad track, is a point on which no light is thrown. Ordinarily, the question of properly limiting the speed of a train is entrusted to two men, the engineman and the conductor. Errors of judgment on the part of the engineman ought to be, or at any rate may be, checked by a vigilant conductor. Here the conductor or conductors did not know the road. A pilot in charge of a train of which the enginemen and the conductor are unfamiliar with the road has, therefore, a delicate and grave responsibility. And so has a railway commissioner who has to report on a case like this. Integrity and devotion to the public interest are only a part of his equipment. Familiarity with his problem is essential.

NEW BOOKS.

The Construction of Concrete Fence Posts. Prepared by the Office of Public Roads, United States Department of Agriculture, Washington, D. C. 6 in. x 9 in.; 31 pages; 9 illustrations.

This pamphlet, Farmers' Bulletin No. 403, is elementary, being written for general distribution, but it covers the subject well and has some suggestions which are as valuable to railway officers as to the general public.

Federal Safety Appliance Acts; Index-Digest of Decisions. By Otis Beall Kent. Prepared by direction of the Interstate Commerce Commission and published at the Government Printing Office, Washington, at 70 cents in cloth, and 40 cents in paper covers.

This is a volume of 294 pages, 6 in. x 9 in., containing an index, with explanatory notes given in all necessary fullness, filling about three-fourths of the book, and an appendix containing the safety appliance acts and reports of a number of court decisions on these acts which have not yet been printed in the regular court reports. During the past ten years a number of suits for damages suffered by railway employees on account of personal injuries in coupling cars, etc., have been fought with great persistence, Mr. Moseley and the leaders of the railway brotherhoods taking care to see that all vital points have been carried to the supreme court of the United States; and, as a result, the powers of Congress and of the federal courts, in dealing with interstate commerce under the federal constitution, have, in these cases, been elucidated with great thoroughness. The notes in this volume, therefore, will serve as a useful abstract of the present state of the law, not only as regards the penalties which are imposed on railways for violation of the act, but also as regards the points which have come up in the numerous civil cases arising under Section 8. Under each topic the decisions by the supreme court of the United States are cited first, and decisions of the lower courts, in proper order, follow; and numerous decisions of lower courts, contrary to the views which finally have prevailed, are given in small type.

Letters to the Editor.

CARELESSNESS (?) AMOUNTING TO DISHONESTY.

St. Louis, June 9, 1910.

To the Editor of the Railway Age Gazette:

As a claim agent I have become weary of having to combat statements which are manifestly dishonest. There is a Freight Claim Association which has a lot of rules, some right and proper, some absurd; some of a kind which it has no right to make as an association, because, as an association, it has no more power than would inhere in individual members, and its individual members could not make such rules for their own roads.

One of the objects of the association was stated originally to be the "equitable adjustment" of claims between members. But it provided a committee of arbitration, and it strictly inhibited the arbitrators from adjudging on the *equities* in any case limiting them to its *rules*. The rules provide no basis for credibility. One agent's statement must be accepted and given the same weight as another's. The agents, having learned this, have apparently discovered a way of taking an advantage not intended and not warranted; and the rules, adopted to facilitate adjustments, rather than secure righteous ones, are used to further ends which are not commendable, and often not honest. Let me illustrate.

Claim for blankets; one of two boxes short, but too large to have been carried off. Agent maintains that he "loaded as billed" September 9; no exceptions." They always say that. It is the absolute truth as to the *record*, but not the whole truth as to the *facts;* for the missing box is billed, with charges, by another road on the 31st of December. It was not loaded as billed, for he didn't have it; but by ignoring the fact, he could say that his "record showed no exceptions."

Another agent billed on January 10 two cases oilcloth. Outturn showed but one. Claim was made February 2. Same story—"Loaded, without exception." But, just the same, that agent billed on the 23d of February the missing case as "wt. and charges ahead Jan. 10."

Another agent, against whose seals a box was "short," maintained that he *loaded* it because his "record showed no exceptions." But a man sent to "stay and see every package on the floor" had "a message to Garcia." He stayed. The foreman said that he knew the box was loaded; loaded it himself. But the man with the message persisted. Had to see every box; would begin with the one the foreman was resting his foot on; it looked like the right box. It was.

Another case was that of a box over a water route, where all the loading agent had to say was that it was "checked from the boat to be loaded into car 94018." In this case, for some inscrutable reason, the positive assurance that it *was* loaded was not put in. That particular car had 13 packages over; but the case wanted was checked short. There was much contention; the claim agent of the loading road maintaining that what his agent said had to be accepted. On an arbitration it would have to be, too. But it happened that a lucky turn in another claim developed that that particular case was loaded in another car two days previously, and had been delivered.

This can be elaborated interminably. The agents all say "no exceptions." They tell the truth as to the records; but the records do not tell the truth. These cases have become so numerous as to suggest that failure to make the records conform to the facts is deliberate and intentional in many instances.

The suggestion has been made to me that those who do such things are dominated by the fear of "losing their jobs." I have yet to make the acquaintance of a manager who would set up as the price of a man's job that he barter his personal self-respect or put his honesty in the scale against the few dollars which his company might have to pay for a box which was billed to him but never reached his station, and which a truthful record would show was never loaded.

I believe that when the higher officers are apprised of the facts they will call a halt, and instruct that honest records be made. Stated differently, I believe that managers will not approve of methods which eventuate in, if they do not deliberately contemplate downright fraud, by omissions, equivocations and evasions.

More, I believe that most men, relieved of the fear which besets them (or because of the lack of moral courage), on account of carelessness they may not wish to confess, will make honest records; and that what is really needed is some indication from above that honesty is desirable and is desired; and, when the assurance of this is promulgated we shall soon be having more credible as well as more creditable records and statements.

S. D. WEBSTER.

THE TERMINAL CONTROVERSY AT ST. LOUIS.

BY SAMUEL O. DUNN,
Western Editorial Manager of the *Railway Age Gazette.*

One of the hardest problems with which railway managers in all parts of the country are grappling is the terminal problem. This is both a physical and a traffic problem. Its solution involves the provision of adequate facilities for expeditiously moving freight and passengers within, into, out of and through large centers of population and industry at rates which will yield a reasonable profit on the investment of the carriers, and at the same time will be neither burdensome to traffic nor discriminatory. Two years ago this problem seemed nearer settlement at St. Louis than at any other city in the United States. To-day it seems very far from settlement there. Briefly, the story of how this reversal of conditions occurred is that the terminal problem at St. Louis, when it seemed on the point of just and satisfactory solution, got into a welter of political ambition and manipulation, newspaper sensationalism and agitation, and real estate speculation in which it has floundered and constantly sunk deeper for 21 months. The story, however, deserves to be told at greater length. For the situation at St. Louis is as instructive an example as is now afforded in this country of the difficulties which a public service corporation, at which the affrighting epithet "monopoly" can be hurled, is apt to meet in making a serious, honest attempt to give the public not only the "square deal" which it justly demands, but even more than a square deal. The organization, and the facilities so far as they have been provided, for handling terminal traffic at St. Louis have been developed thus far along almost ideal lines. As, in spite of this, obstacles to the adequate development of terminal facilities have been encountered there which appear almost insuperable, one wonders how the terminal problem is ever to be solved where the conditions are less favorable.

The *Railway Age*, in its issues of February 14 and February 21, 1908, published two articles entitled "Solving the Terminal Problem at St. Louis." The *Railroad Age Gazette* on September 10, 1909, published an article on the same general subject entitled "Proposed Terminal Improvements at St. Louis." It will be necessary, in order to convey an understanding of the points and merits of the heated controversy now waging in that city about the so-called "bridge arbitrary," to summarize the facts given in the articles referred to.

Prior to 1905 the situation at St. Louis in respect to freight rates and terminal facilities was quite unsatisfactory. When the eastern railways first reached the St. Louis terminal zone there were no bridges across the Mississippi and they built their freight stations on the east side of the river, in East St. Louis, and in effect told the business men of St. Louis that when they wished to ship goods east they must haul them across the river and that when goods for them arrived from the East they must come across and get them. No bills of lading between St. Louis and eastern points were issued. The western lines built their terminals on the west side of the river. The Chicago & Alton, which was in both eastern and western business, crossed its western freight nearly 100 miles up the river and made the same rates between East St. Louis and St. Louis and the West, except on business originating at points within a radius of 100 miles. For competitive reasons, other western roads had to do likewise. Similarly, roads handling traffic between both St. Louis and East St. Louis and the Southeast, South and Southwest made the same rates to both cities except within a radius of 100 to 200 miles. Therefore, except on traffic originating near the two cities, the rates from all sections but the East were the same to both, while on all eastern traffic the shippers of St. Louis had to pay extra charges for getting their shipments across the river.

The shippers of St. Louis felt, and properly, that this arrangement discriminated unfairly against them. Furthermore, there was complaint that the Terminal Railroad Association, which is owned by 14 of the trunk lines, and which, since it was organized in 1889, has acquired control of all the important switching and ferrying lines, was not developing its facilities as fast as the growth of the city's commerce demanded.

WORK OF THE BRIDGE AND TERMINALS COMMISSION.

In 1905 the municipal assembly of St. Louis passed an ordinance creating a "Municipal Bridge and Terminals Commission" "to investigate and determine the nature and extent of the hindrances to the commerce of St. Louis, whether as regards delay or inconvenience in the handling of freight, or disadvantageous charges or methods of shipping or billing of freight, or in any other regard"; to ascertain what should be done to improve condtions and to prepare ordinances and take such other steps as might be deemed desirable to further this end. The mayor was made ex-officio chairman of the commission; the president of the board of public improvements was made ex-officio a member, and the following prominent citizens were appointed members by the mayor: Robert H. Whitelaw, Whitelaw Bros., who was made vice-chairman; Hugh McKittrick, Hargadine-McKittrick Dry Goods Co., who subsequently succeeded Mr. Whitelaw as vice chairman; Joseph D. Bascom, Broderick & Bascom Rope Company; C. W. S. Cobb, Glencoe Lime & Cement Company; R. S. Colnon, Fruin & Colnon, contractors; Homer P. Knapp, Butler Bros., and R. W. Shapleigh, Norvell-Shapleigh Hardware Co. When Mr. Whitelaw retired from the board he was succeeded as a member by Bert Lang, Lang Commission Company. The board employed as expert advisers Albert T. Perkins, a skilled and experienced railway operating officer, and Robert Moore, an eminent bridge engineer, and at once started on a thorough study of the entire situation.

As a result of its negotiations with the officers of the eastern lines, the differentials against St. Louis on eastern traffic outside the 100-mile zone were greatly reduced in 1905, and the differential on soft coal, which originates almost entirely within a radius of 100 miles, was reduced from 30 cents to 20 cents. These reductions were estimated to be worth a large amount to the business men of St. Louis. The eastern roads also agreed to issue bills of lading and to publish through rates to and from St. Louis. This established their responsibility for the safe carriage of goods to and from that city. In 1906 the differentials on classes 1 and 2 were further reduced and the eastern roads agreed to deliver soft coal from Illinois mines on through St. Louis rates free of switching charges to industries on the tracks of all the roads in St. Louis; in other words, the eastern lines absorbed, or paid, the switching charges to industries in St. Louis located on the tracks of western roads. These reductions were likewise hailed with delight by the business men of St. Louis. Early in 1907 the eastern differentials were entirely abolished except on traffic within a zone of 100 miles. The rate from St. Louis to the Atlantic seaboard had been 118 per cent. of the rate from Chicago; that from East St. Louis had been 116 per cent. The rates from both cities were made the same, 117 per cent. to all points in Central Freight, Trunk Line and New England territory. It was estimated that these readjustments in favor of St. Louis shippers amounted to in excess of $2,000,000 per year, besides firmly placing that city on the railway map of the country in a most desirable position. There has been a great deal of talk in St. Louis within recent years about the Terminal Railroad Association being a "huge and grasping monopoly." Its total capitalization is $34,682,000. So in about 15 years, taking into consideration the probable increase in tonnage, the foregoing reductions in rates will almost equal the Terminal's capitalization.

PROPOSED DEVELOPMENT OF THE TERMINAL'S FACILITIES.

There was great rejoicing among the city officials and busi-

ness men of St. Louis when these readjustments of rates were completed. They "put St. Louis on the map"; they established it on the same rate basis as East St. Louis; and these had been for years regarded in St. Louis as the great desiderata. The Bridge & Terminals Commission then turned its attention to securing enlargement of the Terminal's facilities. It was found that it had about 1,650 car lengths of team track, and the commission decided that in order to handle its traffic satisfactorily its capacity should be doubled. By improving its old tracks and building new ones it soon increased its team track capacity about 50 per cent. It also bought the so-called "Ranken tract," about 25 acres of land in the Mill Creek Valley district in the neighborhood of Compton avenue, west of the Union passenger station, at a cost of between $2,500,000 and $3,000,000. By developing this property it intended to increase its passenger faciliites 62 per cent. and its freight facilities 141½ per cent. The land was entirely unoccupied and was used by a dairyman as a cow pasture. But in 1868 streets through it—none of which, however, were ever opened—were dedicated to the city. Therefore, before the Terminal could build team tracks on it and otherwise develop it it was necessary to get the municipal assembly to pass ordinances vacating these paper streets. The Bridge & Terminals Commission drafted the necessary ordinances and they were introduced in September, 1908. The improvements which the Terminal proposed to make on the Ranken tract and other parts of its property in St. Louis would have cost an aggregate of $4,000,000.

Besides having been drawn and introduced by the Bridge & Terminals Commission, the ordinances were endorsed by the city legal department, the street commissioner, the sewer commissioner, the engineers of the various railways affected, the Business Men's League, the Merchants' Exchange, the Manufacturers' Association, the North St. Louis Improvement Association, the Commercial Club, the Lumbermen's Club, the Million Population Club and other bodies. Representatives of 95 per cent. of the freight tonnage of the city advocated their enactment. Now, the municipal assembly was not in any way legally bound to pass these ordinances. But it does seem that it was morally obligated to do so. For it had created the Bridge & Terminals Commission, and it was in pursuance of the act creating it that the commission had got the eastern railways to reduce their rates to St. Louis more than $2,000,000 a year and prevailed on the Terminal Association to buy $3,000,000 worth of land. Nothing could be plainer than that if the Terminal had apprehended it would not be allowed to develop the Ranken tract, it never would have bought it. Furthermore, if there was anybody qualified to say whether the ordinances were needed and were fair, surely that body was the Bridge & Terminals Commission. Yet, in spite of all efforts to get them started on their passage they slept in the railroad committee from September, 1908, to March, 1909, and then were reported back with numerous amendments imposing additional burdens on the railways and the Terminal Association. The committee proposed, among other things, the fixing of a maximum switching charge of $2 per car within the city limits, whether the switching was over the tracks of one or more companies; the fixing of a switching charge of 5 cents per ton for shipments in less than car load lots; the abolition of the so-called "bridge arbitraries" by making the charges for passenger and freight traffic between all points inside and all points outside the St. Louis district no higher per mile than the rates generally fixed by the trunk line railways between points outside of the St. Louis district; the restriction of the streets to be closed by tracks; a requirement that the railway tracks be carried over Compton avenue on a viaduct instead of under it in a subway and that the Terminal deposit $400,000 with the city with which to build the viaduct and file a bond of $500,000 to assume responsibility for all damages that might be sued for by property owners in the vicinity, and a requirement that the Terminal connect its tracks with the "free bridge" across the Mississippi for the construction of which the city has been authorized to issue bonds.

THE COMMISSION'S ORDINANCES DEFEATED.

The report of the committee was referred to, and condemned by, the Bridge & Terminals Commission. The commission said that the regulation of switching charges within the city was a matter to be dealt with by the State Railway Commission. The rates on through business, it stated, had been reasonably adjusted in accordance with its requests, and any further readjustment of them was a matter for the Interstate Commerce Commission. The Terminal Association did not decline to carry the streets at Compton avenue overhead if any feasible plan could be worked out, but no such plan had been suggested. The Terminal made no objection to arranging for connections with the proposed "free bridge" if it was ever built, and, in fact, indicated that it would be glad to have connection with and use it. Despite all the concessions the railways had made, the earnest recommendations of the commission and the support given to the ordinances by most of the shippers of the city, the assembly refused to pass them without the proposed amendments.

TERMINAL OFFERS $2,000,000 MORE.

In April, 1909, a new city administration came into power. The negotiations for the passage of ordinances permitting the development of the Ranken tract were renewed. Some promises the Terminal had made in previous years and not kept were recalled, and it was demanded that it be compelled before further franchises were given it to make reparation for these broken promises.

The Terminal, through its president, W. S. McChesney, Jr., consented to do this. It had once agreed, on certain conditions, to build a bridge across Clark avenue. It having failed to do this, the city brought suit to compel it to. The Terminal carried the case to the State Supreme Court, contending it had been released from its obligation by the failure of the city to carry out its part of the contract in failing to pass the necessary ordinance. The Supreme Court decided in favor of the Terminal. Nevertheless, Mr. McChesney agreed that it should give the city $150,000 as reparation for not having carried out this void contract. The Terminal also agreed to pay the city $200,000 for having in building the Union passenger station encroached beyond the line fixed in its ordinance; $150,000 for having failed to build a passenger station on the North Side in violation of a promise made some years before, and in addition to give the city $500,000 for the rights and privileges to be granted by the proposed ordinances. The foregoing sums aggregating $1,000,000 were to be used, the ordinances provided, for the widening of Market street, on which the Union passenger station faces, or for the establishment of a public park opposite the station; but Mr. McChesney expressly said that so far as the Terminal was concerned the city might do what it pleased with the money. The Terminal also agreed to build viaducts over its tracks at Ewing and Compton avenues and viaducts over its tracks at King's Highway and elsewhere at a cost of another million dollars. It also agreed to build a handsome passenger station in North St. Louis. It therefore bound itself to an outlay of more than $2,000,000 for the public benefit which was not provided for in the ordinances which the city's own Bridge & Terminals Commission had drawn. This seemed like very substantial expiation for all its past sins of omission and commission.

The municipal assembly of St. Louis is composed of an upper house, called the council, and a lower house, called the house of delegates. When the ordinances came up in the house of delegates one of the most prominent business men of St. Louis, who was a leading member of the Bridge & Terminals Commission, was asked by the president of the house if the ordinances were satisfactory to him. He re-

plied, "No"—that he would not have "held up" the Terminal Association as was proposed. The ordinances were sent to engrossment by the house. Then a sensational newspaper wired the presidents of the various railways asking if they would meet representatives of the shippers of St. Louis to confer with the shippers at any time on any subject of mutual interest. The newspapers distorted this into an assurance that they were ready to abolish the bridge arbitraries if the ordinances were beaten. In consequence they were defeated. This was in February, 1910. Meantime, the members of the Bridge & Terminals Commission, feeling that the city, by its refusal to carry out their recommendations had discredited them, resigned, and the commission ceased to exist.

After the defeat of this last ordinance, the municipal assembly on March 15, 1910, passed a resolution providing for the appointment of a committee of members from both its houses to co-operate with a committee representing the shippers of St. Louis in negotiations with the proprietary railways controlling the Terminal Association, "to the end that all remaining so-called bridge arbitraries may be abolished, and upon abolition thereof the terminal facilities of said railways may be increased by ordinances passed on fair and reasonable terms." A general conference between the presidents of the proprietary lines and the joint committee representing the municipal assembly and the commercial interests was held, after which a committee to carry on the negotiations for the railways, and composed as follows, was appointed: T. C. Powell, vice-president Southern Railway, chairman; B. M. Flippin, freight traffic manager, Missouri Pacific; E. Hart, Jr., assistant general freight agent, Baltimore & Ohio Southwestern; L. A. Browning, president, St. Louis & O'Fallon; C. W. Galligan, general freight agent, Chicago, Peoria & St. Louis; C. L. Hillery, general agent New York Central lines. I. H. Sawyer, of the Brown Shoe Co., was made chairman of the joint conference committee representing the municipal assembly and the shippers of St. Louis.

CONFERENCE REGARDING RATES PROVES A FAILURE.

All the members of the railway committee were officers of roads owning an interest in the Terminal Railroad Association, except Messrs. Browning and Galligan. They were appointed to represent the interests of certain small, independent lines running from the mines in Illinois to East St. Louis, of which four, the Litchfield & Madison, the St. Louis & O'Fallon and the Belleville Electric and the Troy & Eastern carry 36 per cent. of the coal delivered in St. Louis. The municipal assembly had made it plain that the main thing it wanted was the abolition or absorption by the eastern lines of the charge of 20 cents a ton for switching coal from East St. Louis across the Mississippi river to industries in St. Louis. A flat rate of 32 cents per ton is charged on coal from Illinois mines to East St. Louis for distances varying from 19 to 80 miles. The addition of the flat 20-cent rate from East St. Louis makes the through rate to industries in St. Louis 52 cents. The small independent roads mentioned haul practically nothing but coal. If the demand that the carriers originating this traffic absorb the 20-cent charge were acceded to, this would leave the originating carriers earnings of but 12 cents on coal moving to industries on the Terminal's tracks in St. Louis. When coal moves from the Illinois mines across East St. Louis and St. Louis to industries beyond the Terminal's tracks, and located on the western railways, the western roads make a charge of 10 cents for switching it from the Terminal's tracks to their own. This charge of 10 cents is now absorbed—in other words, paid—by the eastern lines which originate the coal, thus making the rate to all industries in St. Louis, whether on the Terminal's tracks or on those of the individual western railways, 52 cents, and leaving the eastern lines earnings on coal moving to the tracks of the western lines of but 22 cents a ton. If in addition to absorbing this charge of 10 cents, the eastern lines absorbed the Terminal Association's charge of 20 cents, they would be left but 2 cents per ton for hauling from the mines to East St. Louis—distances of 11 to 80 miles—coal destined to industries located on the rails of the individual western roads. This would be a ridiculously noncompensatory rate for even the strong eastern trunk lines on the coal that they originate; and it would mean quick bankruptcy for the small independent roads which handle practically nothing but coal. But despite the vital interest that the small lines had in the negotiations, when the joint committee representing the city and the shippers, and the sub-committee representing the railways, met on March 18, the shippers absolutely refused to treat with the railway committee if Messrs. Browning and Galligan were allowed to remain on it. The conference broke up when the committee representing the Municipal Assembly and the shippers withdrew.

TWO DISTINCT QUESTIONS INVOLVED.

The foregoing shows that there are two questions involved in this controversy. The first is, whether the Terminal Railroad Association, which is owned by 14 trunk lines, shall be allowed to improve and increase its facilities. The second is whether the eastern railways, large and small, some of which have no interest in the Terminal, except that they handle through traffic in connection with it, shall make the same rates to and from St. Louis that they make to and from East St. Louis on traffic originating within a radius of 100 miles, and particularly on coal, its supply of which St. Louis gets entirely from mines east of the river. These, plainly, are distinct questions. The only railways directly concerned in the question whether the Terminal's facilities shall be enlarged are those which own it. In how the question of rates shall be settled, the small lines having no propriety interest in the Terminal are more vitally interested than its proprietors. Furthermore, there is no difference of opinion among the managers of the railways and the shippers and officials of St. Louis as to whether the Terminal's facilities should be improved and increased. On the other hand, there is a wide difference of opinion even among shippers themselves as to the justice of the proposed abolition of the rate differentials within the 100 mile zone. Why, then, it may be asked, are these two questions linked together? The reason is plain. It is sought to use the Terminal's needs as a weapon for coercing both the railways which own it and those which have no interest in it into making the desired concessions in rates. But it is seen that the small lines cannot with the slightest semblance of fairness be asked to absorb the Terminal's 20 cent charge. Therefore it is sought to bar them from the negotiations; it being known that if the desired concessions can be wrung from the eastern trunk lines the small, independent lines will, for competitive reasons, have to meet any through rates which the trunk lines make.

It is so generally conceded that, assuming a fair adjustment of rates, the Terminal should be allowed to make the improvements planned by it, that the only one of these questions that needs to be considered by those not having some special purpose in preventing the Terminal from making those improvements is as to whether the existing adjustment of rates is fair, and if not, how it can be made so.

ALLEGED DISCRIMINATIONS AGAINST ST. LOUIS.

Those who criticise the present adjustment do so upon the ground that it discriminates against and imposes an undue burden on the commerce of St. Louis. The alleged discrimination consists in the fact that on traffic moving between St. Louis and points within 100 miles east of the Mississippi river the rates are higher than the rates of East St. Louis, the difference most complained of being the charge of 20 cents per ton collected by the Terminal Association for delivering coal to all points on its tracks in St. Louis. It is contended that this is contrary to the usual method of making rates. This contention is groundless. It is almost the

universal practice for railways to make an extra charge for short hauls in the course of which commodities move over costly bridges across large rivers. On traffic moving to and from New York and Jersey City an arbitrary for lighterage is charged on shipments within a radius varying from 65 to 135 miles. Among other points which may be cited at which substantial bridge arbitraries are imposed on traffic moving from a minimum of 54 to a maximum of 174 miles are Louisville, Ky., and Jeffersonville, Ind.; Louisville, Ky., and New Albany, Ind., and Omaha, Neb., and Council Bluffs, Ia.

Another contention made is that the adjustment of rates puts shippers in St. Louis at a disadvantage as compared with those in East St. Louis. But, as a matter of fact, the extra charges imposed for crossing the bridges at St. Louis apply both ways. The result is not only to make the rates between eastern points and St. Louis higher than they are to East St. Louis, but also to make the rates between western points and East St. Louis higher than they are to St. Louis; and the differentials both ways are about the same. The following gives the maximum distances on some eastern railways for which the rates from St. Louis are higher than they are from East St. Louis: Chicago & Alton, 99 miles; Southern Railway, 78 miles; Vandalia, 101 miles; Illinois Central, 103 miles; Chicago, Burlington & Quincy, 98 miles. The following gives the maximum distances on some western railways for which the rates from East St. Louis are higher than they are from St. Louis: Missouri Pacific, 117 miles; Chicago, Burlington & Quincy, 75 miles; St. Louis, Iron Mountain & Southern, 180 miles; Wabash, 84 miles; St. Louis & San Francisco, 198 miles. The average distance at which the shippers of East St. Louis cease to pay higher rates on westbound traffic than the shippers of St. Louis is 140 miles, while the average distance at which the shippers of St. Louis cease to pay higher eastbound rates than the shippers of East St. Louis is 106 miles. These figures show that if there is any unfair discrimination it is in favor of St. Louis, and not against it.

THE "UNREASONABLE" BURDEN ON ST. LOUIS.

Those who oppose ordinances to permit the Terminal Association to increase its facilities reply to facts such as the foregoing that at least the rate of 52 cents on coal to St. Louis is unfairly discriminatory and excessive as compared with the rate of 32 cents to East St. Louis and imposes an undue burden on its manufacturers. But, as already indicated, shippers of raw materials originating within the 100 mile zone on the *west* side of the river and moving to *East St. Louis* also have to pay the 20 cent charge across the river. For example, there are manufacturers of glass in both East St. Louis and St. Louis. All of them use a large amount of sand, which is hauled from Klondike and Pacific, Mo. The consequence is that while the glass manufacturers of East St. Louis have an advantage in the rate on coal, the glass manufacturers in St. Louis have the same advantage in the rate on sand. On another very important raw material, lumber, the rate, regardless of whether its point of origin is *east or west* of the river, is 1½ cents per 100 lbs., or 30 cents per ton higher to East St. Louis than to St. Louis.

It is evident that there is no unfair discrimination against St. Louis as compared with East St. Louis. If the 20 cent charge of the Terminal Association is unjust to either St. Louis or East St. Louis it is unjust to both; and if it is unjust to both this must be because it is excessive *per se* for the services rendered. That it is excessive *per se* the critics of the Terminal contend to be the fact. They concede that the rate of 32 cents per ton on coal to East St. Louis is fair and contend that a charge of 20 cents for the additional haul from East St. Louis into St. Louis is excessive. The distances that coal is hauled in large quantities to East St. Louis vary from 11 to 41 miles, and the rates per ton per mile from $^{78}/_{100}$ cents to 2 $^{9}/_{10}$ cents. The distances that the coal is hauled by the Terminal Railroad Association from its connections with the eastern lines in East St. Louis to industries on its tracks in St. Louis vary from 8 to 17 miles and the average rate it receives per ton per mile varies from 1 $^{5}/_{10}$ cents to 2 $^{5}/_{10}$ cents. The rates per ton per mile received by the Terminal Association are little if any greater than those received by the originating carriers. Now, the Eads and the Merchants' bridges over which the Terminal has to haul the coal to get it from East St. Louis into St. Louis cost, respectively, $6,826,730 and $8,733,483. The Municipal Bridge & Terminals Commission estimated that to build a bridge across the Mississippi river to carry four railway tracks would cost $8,000,000. A good, double-track railway can be built for $100,000 a mile. The Eads bridge, therefore, cost the equivalent of 68 miles of good, double-track railway, and the Merchants' bridge the equivalent of 37 miles of good, double-track railway. A bridge is a very expensive structure to maintain and operate, as well as to build. On the basis of cost of construction, maintenance and operation a bridge across the Mississippi river at St. Louis is equivalent, conservatively, to 50 miles of double-track road mileage. Furthermore, all of the lines of the Terminal are located where real estate is very valuable, and are therefore worth a great deal more per mile than the road mileage of even the very best double-track railway. A very low rate for transporting coal for long distances on ordinary road mileage is four mills per ton per mile. The average distance the Terminal Association hauls coal is about 12 miles. The total average distance that it hauls the coal, therefore, is equivalent to at least 60 miles of road mileage. Its actual rate being 20 cents a ton, and its average *constructive* haul 60 miles, its average *constructive* rate per ton per mile is three mills. Far from being a high rate, this is an exceedingly low one.

Not only is the Terminal's 20 cent rate, which is a flat one on traffic moving to all industries on its belt lines, low, but the burden that it imposes on the industries of St. Louis is absurdly exaggerated. The total coal hauled across the river by the Terminal in the year ending June 30, 1909, was 4,882,749 tons. Of this 823,180 tons was for the use of the railways themselves, which, therefore, paid the Terminal's charge on it; and 844,977 tons moved on through rates to points west of St. Louis. Of the rest, 2,159,589 tons was coal which was unloaded on the tracks of the west side lines in St. Louis, and on which, therefore, the eastern lines absorbed the switching charge of 10 cents, leaving them but 22 cents per ton for hauling it, and 1,055,003 tons were unloaded on the Terminal's tracks in St. Louis, making a total of 3,214,592 tons on which the shippers of St. Louis paid freight. Of the total charges collected by the Terminal on this coal $164,333 was paid by the railways on what they consumed; $168,995.40 was paid on coal moving entirely through St. Louis to points west of it; $431,918 was paid by St. Louis shippers on coal delivered on the western railways' tracks and $211,000 was paid by St. Louis shippers on coal delivered on the Terminal's rails. So the total amount of the charges on coal paid by the shippers of St. Louis to the Terminal was $632,918. The total value of the manufactured products of St. Louis in 1909 was $310,000,000. Therefore, the total amount that the shippers of St. Louis paid to the Terminal Association for the transportation of coal was $^{2}/_{10}$ of 1 per cent. of the value of the manufactured products of the city! And this $^{2}/_{10}$ of 1 per cent. is the insuperable obstacle which, it is said, keeps manufacturers from locating in St. Louis; the terrible menace to their prosperity which drives industries now located there to other cities; the incubus whose weight is pressing out the city's commercial life! The *increase alone* in 1909 in the value of the manufactured products of St. Louis was $35,030,451, or 55 times as much as the *total* amount that its shippers paid to the Terminal in coal rates.

THE PROBABLE TRUE REASONS OF OPPOSITION TO THE ORDINANCES.

The foregoing facts and figures amply demonstrate that the Terminal's charge of 20 cents per ton is not unreasonable and that it does not impose any perceptible burden on the industry

and commerce of St. Louis. While it furnishes a good pretext for withholding from the Terminal the ordinances necessary to enable it to develop its facilities, it plainly is not a sufficient cause for the determined, effective opposition to these ordinances.

Perhaps a speech made by Frank H. Gerhart, a prominent St. Louis real estate man, at a public hearing of the committee on railways of the house of delegates on January 21, 1910, and reprinted and widely circulated with the "compliments of the St. Louis real estate exchange," may throw some light on the true source and cause of some of the effective opposition. Mr. Gerhart said that "several other eastern lines may move or extend to St. Louis, caused by the refusal of the municipal assembly to grant privileges to their intermediary Terminal Railroad Association, *which is the very thing that we want.*" He estimated that if the seven lines which now have their freight houses in East St. Louis were forced to establish freight terminals in St. Louis, they would have to spend in St. Louis about $3,000,000 each, or an aggregate of $21,000,000. "If," he said, "we refuse to give any additional franchises to the Terminal Association, the other east side lines are certain to come over. * * * If we insist upon dealing only with them and offer them all reasonable legislation in vacating streets and alleys, etc., for their required freight houses and not with the Terminal Railroad Association, they will come over and locate here."

Now, who would benefit by the enforced expenditure by the eastern railways of $21,000,000 for terminals in St. Louis? Why, obviously, the real estate men for whom Mr. Gerhart spoke. They figure that if, instead of the Terminal Association being allowed to develop its facilites so that it can economically handle the St. Louis traffic of the eastern roads, it is closely bottled up, the eastern roads will have to come across the river themselves and establish terminals, in which event the *public-spirited* real estate men of St. Louis will be able to sell a great deal more real estate than they could sell to the Terminal Railroad Association alone. That the real estate men might cherish such views is not surprising. That they should have the impudence to publicly avow and widely circulate them is an insult to the intelligence of the people of their city. That shippers should lose rather than gain by the establishment of numerous expensive terminals is obvious. This would increase the cost of hauling traffic in and out of the city, and ultimately the shippers would have to pay in the rates the increased fixed charges and cost of operation resulting.

Other influences that have been potent in preventing the passage of the ordinances have been certain active politicians and sensational newspapers. Denunciation of the Terminal "monopoly" has for some years been their chief stock in trade, and many members of the assembly have been loath to vote for additional franchises for the "monopoly" for fear that they would promptly be marked for slaughter by this class of politicians and newspapers. The more fair and conservative papers of St. Louis have consistently advocated the passage of reasonable ordinances.

CITY MORE INJURED BY DELAY THAN RAILWAYS.

The delay in passing reasonable ordinances is injuring both the Terminal and the trunk line railways. The Terminal's fixed charges on the Ranken tract alone, from whose ownership it as yet has received no benefit whatever, amount to $120,000 a year. But ultimately the restrictions on the improvement and expansion of its properties will hurt the commercial interests of St. Louis more than they do the Terminal or the roads that own and use it. About 75 per cent. of the traffic that moves over its rails is business which both originates at and is destined to points outside of St. Louis. It is having no trouble in handling this traffic. It interchanges over 8,000 freight cars per day for the trunk lines with an average detention of but 1.60 days per car, which includes time consumed by receivers and shippers in unloading and loading cars. It will continue to be able to handle this through traffic satisfactorily, as it has bought 100 acres of land between Madison, Ill., and East St. Louis, where it will build a classification yard with a capacity for 4,500 cars. It is its capacity for handling traffic within, and traffic originating in and destined to, St. Louis whose growth is being cramped. Between 1898 and 1909 the bank clearings of the city increased from $1,700,000,000 to $3,442,000,000. The value of its manufactured products increased from $197,000,000 to $310,000,000. The total tonnage received and forwarded at St. Louis and East St. Louis increased from 23,000,000 to 44,000,000 tons. Meantime the facilities of the Terminal for handling freight to, from and within the city increased but 7 per cent. It is quite obvious that unless work is begun very soon on the improvement and enlargement of its steam tracks and other properties it is going to become incapable of handling satisfactorily the traffic of the St. Louis terminal district.

Unless the statements of fact made in this article and the conclusions drawn from them are entirely erroneous, the shippers of St. Louis have no good ground for complaint about their existing rates. But if they really believe they have, it would seem that the policy of trying to force concessions in rates from the through lines by preventing the development of the Terminal is simply cutting off the city's nose to spite the railways' face. If the rates to and from St. Louis are unfair its shippers can get them made fair by appealing to the Missouri Railway Commission or the Interstate Commerce Commission. The city probably will never get the concessions in rates it demands, and by persisting in making the passage of the Terminal's ordinances conditional on them, it will hamper the development of the Terminal's facilities to an extent that will cause losses to the shippers of the city far in excess of all they would gain if they got all the concessions in rates sought.

MAIN POINTS OF THE NEW RAILWAY LAW.

Section 1 establishes the Commerce Court with jurisdiction over:

First.—Enforcement of Interstate Commerce Commission orders, except for penalties, criminal punishment, or collecting money.

Second.—Annulling or suspending commission's orders.

Third.—Commission's suits to correct illegal practices.

Fourth.—Suits to compel compliance with commission's orders under Secs. 20 and 23.

Five additional circuit judges are to be appointed by the President.

Section 2.—Judgments may be appealed to the Supreme Court, and shall have precedence over all except criminal cases.

Sections 3, 4.—Suits against commission's orders shall be vs. United States, and the court decides whether or not the order is stayed.

Section 5.—Attorney-General has control of suits and may employ special counsel; the commission or anyone interested may intervene.

Section 6.—Carriers must designate an agent in Washington to accept service of notices.

Section 7.—Extends interstate commerce law over telegraph, telephone and cable companies, and enlarges list of railway employees who may receive passes; strengthens various details of law.

Section 8.—Changes the long and short haul clause so as to leave the question of similarity of conditions to be decided by the commission. Six months' delay allowed. Rates reduced to meet water rates cannot be increased without commission's authority.

Section 9.—Authorizes the commission to reject tariffs with defective notices. Penalizes the carrier $500 or $25 a day

for non-compliance with orders. On written request carrier must give written statement of freight rates to any place on its tariffs; penalty for delay or mistake $250. Agent's name must be posted at each freight station.

Section 10 revises penalties for false billing, etc., and penalizes frauds in presenting claims for damage to freight. Section 11 empowers commission to act on its own motion in all matters except ordering payment of money; amplifies and strengthens Sec. 13 of old law.

Section 12 authorizes the commission to suspend new tariffs 120 days from date they would go into effect, and six months beyond (10 months in all) if necessary for inquiry. Carrier must prove reasonableness of any proposed increase. Commission shall not compel through rates with street electric passenger railways; nor compel a road to put a *part* of its line between two points into a through route. Wrongful divulgence of information about a shipment is penalized.

Section 13 allows suits to compel a carrier to pay money to be entered in state courts.

Section 14 allows commission to require annual reports Dec. 31 instead of June 30 if it see fit.

Section 16 authorizes the President to appoint a commission to investigate propriety of federal regulation of stock and bond issues.

Section 17 regulates issue of interlocutory injunctions to restrain enforcement of state laws.

Section 18.—Law takes effect August 18 except Sections 12 and 16, which take effect at once.

COMPENSATION AND COMPENSATION ACTS.*

BY FRANK V. WHITING,
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It may surprise you to know that in 1838 Prussia changed the burden of proof with respect to its railways, by making the companies liable for all accidents that they could not prove to be due to unavoidable circumstances or to the negligence of the victim. Upon the foundation of the German Empire in 1871 this law was adopted and thence it spread throughout Europe, even to despotic Russia. We have gradually seen the defense of "fellow servant" narrowed, so far as corporations are concerned, and broadened with reference to workmen, until in some states, especially with reference to the hazardous part of the railway business, not a vestige remains. Likewise the defense of "assumed risk" has been partially taken away and we are now testing a federal law which, to a great extent, abolishes the doctrine of contributory negligence.

In some form or other these acts have been passed in twenty-three foreign countries and provinces, consisting of the following: Austria, Belgium, British Columbia, Cape of Good Hope, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Luxemberg, Netherlands, New Zealand, Norway, Quebec, Queensland, Russia, South Australia, Spain, Sweden and Western Australia. These countries have adopted systems more or less in conformity with the idea of changing the basis from that of negligence or fault to that of rightful compensation or insurable risk as an incident of the business.

The general provisions of these laws follow:

With the exception of Austria all countries require employers to provide funds to meet payments for accidental disablements and deaths, although in some, notably Germany and Austria, temporary accident disablement is paid from sickness funds. Compulsory insurance by the employer is required in Austria, Belgium, Finland, Greece, Holland and Norway. Indemnity generally includes medical expenses and a percentage of wages running from 50 per cent. to 70 per cent. for permanent disability, and in many states continuing during disability. Practically all provide for payments for partial disability. Death indemnity is usually fixed as to minimum and maximum amounts and based on from three to five years' wages. Frequently provision is made as to the apportionment of the funds and also for the proper investment thereof. In several countries lump sum settlements are authorized for disposing of permanent disability cases. Employers' liability is usually confined to cases of gross negligence and the employee may elect whether to sue or accept under the compensation laws. Funeral benefits in very small sums—$10 to $20—are provided. In Great Britain ten pounds, payable only when no dependents.

One of the most important features of compensation laws is that of the waiting time. This means the time that elapses between the date of the accident and the time when compensation begins. This time has been fixed commencing as in Holland, Belgium and Spain, and in most instances Great Britain, with the date of the accident, and from three days to thirteen weeks in other countries. In Germany, however, the first thirteen weeks of disability from accident are paid from sickness insurance funds, two-thirds being contributed by workingmen and one-third by employers. In Great Gritain the waiting time has been unfortunately fixed so that while no compensation is given if the time lost does not exceed a week, yet if the disability continues for two weeks or more the compensation dates back to the time of the accident. Obviously, this makes an incentive for some men to remain off longer than necessary, and they, in fact, receive a premium for so doing. It is my opinion that at least ten days to two weeks should be allowed as the waiting time and under no circumstances should payments date back.

The British Workman's Compensation Act provides for payment to workmen generally when injured in the course of their employment due to accident arising therefrom, also covering certain trade diseases. Includes all classes of workmen, covering practically every public relationship of master and servant, except any person employed otherwise than by manual labor whose remuneration exceeds $1,216.63 (£250). No liability if caused by serious and willful misconduct of injured servant, *unless* death or serious and permanent injury results. Option is given to sue under civil liability if due to personal negligence or wilful act of employer or some person for whose act or default the employer is responsible. Court may make allowance under act if suit for damage fails. Medical practitioners, appointed by state, to be medical referees. Compensation is based on average earnings for twelve months in case of injury, and three years' earnings for death.

Death.—Three years' earnings, minimum $729.98, maximum $1,459.95. If no next of kin wholly dependent, amount to be agreed upon. If no dependents, medical and burial expenses not exceeding $48.67.

Injury.—Total or partial incapacity, weekly payment not exceeding 50 per cent. of average weekly earnings, but not over $4.87.

Waiting Time.—No allowance for first week if disability under two weeks, if over this, dates back to the time of accident.

Examination.—Workmen required to submit to an examination from time to time.

Arbitration.—(1) By committee representing employer and employee. (2) By single arbitrator agreed upon, or in the absence of agreement, by the judge of the county court.

Diseases Covered.—Anthrax, lead, mercury, phosphorus and arsenic poisoning, ankylostomasis. (mining.)

The Quebec Compensation Act took effect January 1, 1910, and is radically different in some respects from the English Act. It does not apply to workmen who earn in excess of $1,000 per annum. The 50 per cent. allowance for injury applies only where the earnings do not exceed $600. Excess between $600 and $1,000 is on the basis of 25 per cent. The compensation for death, while fixed at four times the average

*A paper read before the Association of Railway Claim Agents at Chattanooga, May 25.

yearly wages, is not less than $1,000 nor more than $2,000. The important features are:

First.—Payment for permanent or partial incapacity is limited to $2,000. Second.—The Act excludes other legal rights as to those workmen that come within it.

The United States Government passed a compensation act in 1907 for its artisans and laborers, providing for the payment of one year's wages if injured in the course of their employment. In case of death dependents receive same as victim would if merely injured. No payment made if accident is due to negligence or misconduct or if not over 15 days' disability.

Various states have studied and are now studying this question through commissions. The Wright Commission in Massachusetts reported six years ago, and as early as 1902 Maryland enacted an insurance law requiring an indemnity for employees, limited to $1,000 in case of death, exempting employers from further liability. The law was held unconstitutional for the reasons that it limited the amount for death, denied trial by jury, and the right to remedy by the law of the land for injury done. It has also been stated that the act was declared unconstitutional on the ground that it attempted to vest judicial powers in the commissioner of insurance. (The act in its operation and the opinion of the Court of Common Pleas appeared in part in the quarterly Journal of Economies, August, 1902, and February, 1905, articles by George E. Barnett.)

In 1907 the Industrial Insurance Commission in Illinois recommended an accident insurance law along the lines of the English Compensation Act. Essential features reported by the Illinois Commission contained provisions permitting the employer to contribute an amount which he would probably have to pay under the law of negligence, releasing him from liability for damage suits, and then distributing the money on the insurance principle, the employee being encouraged to carry as much additional insurance as he could. This law was proposed in the New York Legislature as early as 1898.

The Montana Mining Act tries to put in force the examples of European experience. (Ch. 67, Laws of 1909, page 81.) It creates a state accident fund applying to workmen in and about mines, etc. It taxes employers one cent per ton on coal mined and shipped and employees 1 per cent. of gross monthly earnings. Funds so accumulated are to be invested by the state audtor, who is to pay to dependents (not foreigners) of each employee killed the sum of $3,000. Miners permanently disabled receive a dollar per day. Loss of limb or eye is to be paid $1,000 in addition. Acceptance of these benefits bars all right of action against employers who have paid the tax. Special attention is called to the fact that this act provides for contribution between the employer and employee, but it does not cover injuries of a temporary nature. It is the first state law in this country where the liability to pay is based on the hazard of the particular employment.

Minnesota, Wisconsin and New York, with one or two other states, are now studying the question.

A commission in New York has recently made its first report and as a result there are now pending in the New York Legislature two compensation bills, one a compulsory compensation act, applying to hazardous occupations, such as the erection or demolition of bridges and buildings, working on scaffoldings, electrical work, blasting and the operation and maintenance of railways. (The New York Commission in its report states that this law is not applicable to railway employees engaged in interstate commerce, for whom Congress has already legislated.) Under this act the employee may elect after injury whether to take the compensation or to bring an action at law to recover damages in the regular way. The other is an amendment to the Employers' Liability Act, enhancing the liability of the employer and providing a permissive scheme of compensation which allows the employer and employee to contract in favor of compensation exclusively. The compensation feature of this law is denied to railway companies. (This bill passed the legislature this month.)*

These acts provide for the payment in case of death of 1,200 times the daily wage, but in no case to exceed $3,000, and for injury an allowance of 50 per cent. of time lost for a period of not more than eight years. The compulsory act requires payment for personal injury by accident arising out of and in the course of the employment or one inherent in the nature thereof, or on account of the failure of an employer or any of his employees to exercise due care or to comply with any law affecting such employment. Waiting time fixed at two weeks. No allowance if injured workman is guilty of serious and wilful misconduct. The permissive scheme in the Employers' Liability Law, if accepted, provides for payment under the same conditions.

There was another act recently introduced into the New York Legislature requiring employers to insure employees in an amount not exceeding $20,000, and I doubt if the author knew what was meant.

There is a bill pending in Congress known as the Sabbath bill, which, in my opinion, would bankrupt most of the railways in this country if it became a law. Based on 73 death cases which occurred in the first nine months of 1909 we estimated that under the Sabbath bill it would eventually cost $1,652,419 to dispose of these cases. Taking the same cases as a basis we estimate that under the Compensation Acts in New York the increased average cost for deaths would be more than 200 per cent. This would mean on a death rate of 200 if all employees were brought within the Compensation Acts an increase annually of payments for deaths only of about $400,000.

I mention the above just to show the danger that lies in hasty legislation and in the proposal of laws by persons who are not thoroughly conversant with the subject. It is immaterial to me to what extent they study compensation laws, economic questions, etc.; they must get over on our side of the fence and know something about the number of accidents and the financial liability that corporations would be placed under before they can draft intelligent laws. The objection is not so much to the principle of compensation as the extremities to which we may be forced through lack of understanding by our legislators and the insistent demands of labor. When acts are drawn and proposed, investigation ceases. It is only when something definite is proposed that the results that will naturally follow can be ascertained and investigation should continue. The danger of a large increased expense lies in the amount that may be fixed for death and the length of time for which compensation is payable for permanent injuries which wholly or partially impair the earning capacity.

The demand for this sort of legislation is greater than you think. There is strong current of public opinion in favor of it and I question whether employers generally would be opposed to such legislation if it were reasonable. Two great corporations have voluntarily adopted systems of compensation recently. Many companies practice compensation in a more or less systematic way. In fact, my investigation leads me to say that as a rule, with the exception of the so-called non-liability, serious injury and death cases, railway employees are as well protected and provided for as they would be under any reasonable compulsory scheme of compensation.

There are several important features which have not been given proper consideration and attention in the various compensation laws that have been passed:

1. I can see no reason from an economic or other standpoint why compensation should be given the next of kin for any period of time beyond the expectancy of life of the deced-

*The amended Employers' Liability Act has become a law and the compulsory bill has passed the legislature and is now in the hands of the Governor.

ent. In other words, the maximum amount payable for death should be decreased by a fixed annual percentage with the increased age of the decedent.

2. It seems to me that compensation to a certain extent should be based upon the number and age of the next of kin, i.e., greater compensation should be paid where deceased leaves a widow and several children than where he leaves but a widow. This can be accomplished by increasing the maximum rate on a percentage basis for each child.

3. Definite lump sum payments should be provided in case of certain permanent injuries.

4. All payments should, when possible, be based on previous average earnings and not daily rates.

5. We should follow the advice of economic writers to the effect that when compensation is provided rights to recover damages should be eliminated.

Are we not in this country rapidly drawing to the point where compensation, or rather damages, will have to be paid for all injuries caused in the industrial and transportation fields through negligence? In other words, must we not concede that the defenses of "fellow servant," "assumed risk" and "contributory negligence" are not only rapidly but lawfully being swept away? This being true, it is but a short step across the line to the point where all accidents shall be compensated, even where there is no fault on the part of the employer or his employees. * * * Employers of labor, and especially railway companies, pay out large sums annually for damages on account of accidents to employees. A certain percentage of this money is waste. Some economic writers place this as high as 50 per cent.—but it is a great deal less. The problem seems to be whether the money that now goes to waste in the shape of court expenses, lawyers' fees, etc., can be conserved and paid direct to the injured. Whether the cost for compensation can be fixed so that there will be little or no increase in the expense to employers.

After all it is not wholly a question of expense. The laborer is not only worthy of his hire, he has the right to look for the redress of his wrongs. Lord Asquith says: "The blood of the workmen is a part of the cost of the product." Then why not count it as such? We repair or replace broken or worn out machinery. Why should we not, in part at least, alleviate the distress, the suffering and the want of those who toil for the good of society by requiring that society to bear its fair share of the burden which unfortunately its needs create.

TONNAGE RATING FOR FAST FREIGHT TRAINS.

BY J. G. VAN ZANDT, C.E.

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II.

In a previous article* the writer presented a method for adjusting tonnage and speed ratings of freight trains with examples. It is here proposed to explain in detail the computations and present the data on which this method was based.

The general plan adopted was to determine the theoretical tonnage rating for several selected types of locomotives at present in use. In the determination of the rating, the factors influencing the power of the locomotive were taken as far as possible from actual tests, checked by further data from experiments made upon other types. The results of experiment rather than empirical formulas were used, the investigation resolving itself primarily into the following general divisions:

I Locomotives.
- (a) Selection of types.
- (b) Steam.
- (c) Tractive power.

II Train Resistance.

III Tonnage Rating.

IV Operation.
- (a) Speed-distance computation.
- (b) Speed-time computation.

V Application.
- (a) Profile.
- (b) Theoretical running time.
- (c) Time tonnage curves.

Railway Age Gazette, June 17, 1910, page 1547.

I. LOCOMOTIVES.

(*a*) *Selection of types.*—Of the many locomotives at present in use on the railways of this country, the majority may be

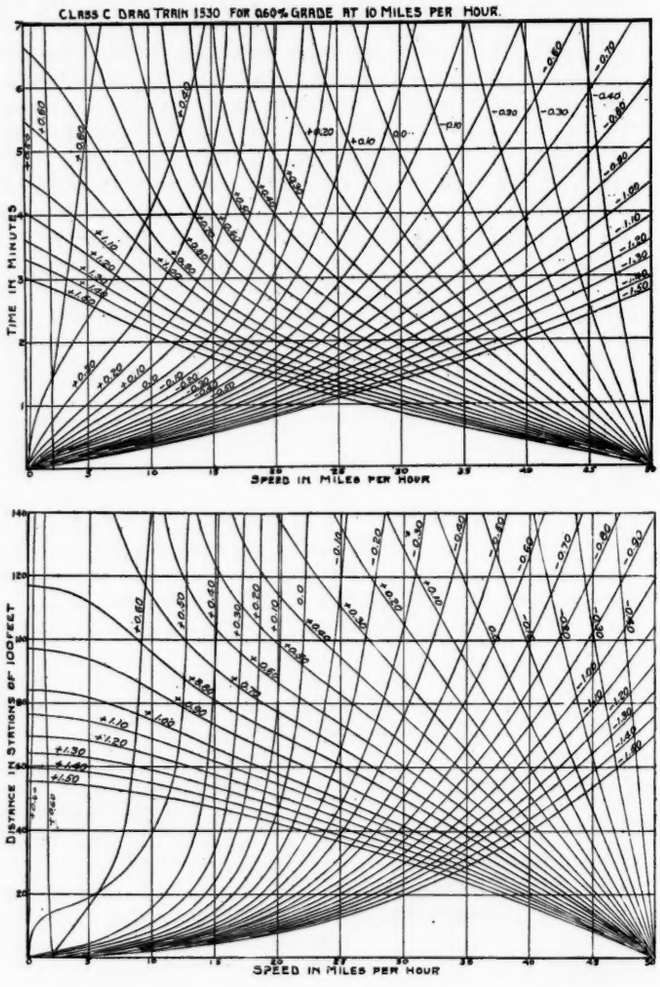

CLASS C DRAG TRAIN 1530 FOR 0.60% GRADE AT 10 MILES PER HOUR.
TIME IN MINUTES
SPEED IN MILES PER HOUR
DISTANCE IN STATIONS OF 100 FEET
SPEED IN MILES PER HOUR

Fig. 1.

classed under the three following general types, details of steam capacity being given in Table I, herewith:

2-6-0 (A) 8-wheel mogul.
2-8-0 (B) Consolidation.
4-6-0 (C) 10-wheeler.

(*b*) *Steam.*—After a careful investigation, both by tests and from records of other authorities and from theoretical computations, the following speeds were adopted as affecting the question of steam consumption and its economy:

Class "A" 9.6 m.p.h.
" "B" 11.72 m.p.h.
" "C" 10.41 m.p.h.

The curve of mean effective pressure for speeds above this point of maximum boiler capacity is dependent on the ability of the boiler and the design of the connections with the cylinders. The results of the tests made by the Baldwin Locomotive Works upon new engines would be expected to come above those of average working conditions and the plotted curve appears to follow the curves thus derived, in a parallel line about 5 per cent. above them. The results of

Wellington's experiments* give values which, when worked up on the same basis of comparison, lie almost coincident with the curves above derived. The curve adopted by the Master Mechanics' Association is an exceptionally satisfactory check upon these results, especially since the curve represents the result of extended research with average conditions.

The heavier types show a slightly higher efficiency in percentage of available boiler pressure, though there seems to be a remarkably close agreement throughout. There is, however, a crossing of the curve at 25 miles per hour, showing that the heavier engines are not capable of as high efficiency at higher speeds. This would become even more apparent if passenger locomotives were used in the comparison, since it is desirable that greater power be available at higher speeds in those designs. In general it would develop that the heavier the locomotive the steeper the slope of the mean effective pressure line, since it is necessary that the greatest efficiency should be developed at slower speeds.

(c) *Tractive power.*—The measure of the ability of a locomotive is not so much the individual factors which have been discussed, but the final available tractive power which the engine, influenced in certain ways and under varying conditions of those factors, is capable of exerting in moving cars. Many methods of interest and value have been suggested and used for the expression of this force, the two following being the most prominent:

1. Tractive effort in pounds at rail.
2. Drawbar pull in pounds back of tender.

During the operation of a train we must assume that we

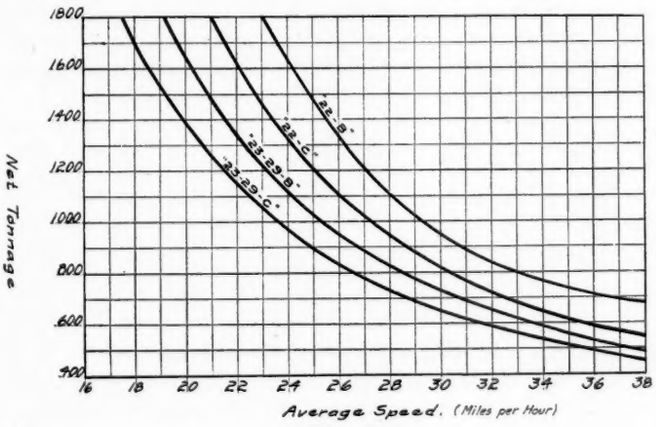


Fig. 2.

are operating with a force only at the pulling of the drawbar of the first car at all times, the amount of that pull to be determined by the tractive force at the rail, less the resistances between that point and the drawbar. As a matter of fact, there is often found to be a drawbar push and at times a pull, much in excess of that obtainable at the drivers. This is due to the momentum of the locomotive, which is by no means a negligible factor. The kinetic energy stored up in the moving engine and tender is a matter of considerable influence in the momentum runs. Further, the energy of the rotating drivers is much greater than that of any other wheels in the train and would materially assist in the increase of this part of the total. Many have overlooked, or not considered this very factor, but in many instances it has been shown to be of importance and hence, in order to secure accuracy of even reasonable amount, it should be included.

For the three types of locomotives selected the available force was plotted, the latest and best of standard formulas being used for the tractive force, resistance of machinery internal in the engine and the internal friction as given by Henderson. The questions considered are shown in Table II. The values of the constants are also stated and the process is indicated. A comparison of results is readily made and many points of interest appear. It is evident that the value of the tractive force, using the formula proposed by Dr. Goss for internal friction, gives the highest results though checking very well above 15 m.p.h. The use of the "St. Louis Constants" gives higher values at low and lower at high speeds. The two formulas of Henderson run nearly together, crossing at about the place where the St. Louis line crosses them both. The theoretical line of the hyperbola, based on higher mean effective pressure curves, represents a slightly lower value at low speeds and somewhat higher for higher speeds up to 50 m.p.h., where it again reaches the lower lines. It checks reasonably well, however, the lower values which seem to lie nearly together and if based upon average conditions at higher speeds would probably lie close all the way. The average of the curves, based upon tests upon these engines, is taken as representing fairly well operation under ordinary conditions.

The explanation of the letters used in Table II is as follows:

$M.\ P.\ H.$ = miles per hour.
$M.\ E.\ P.$ = mean effective pressure.
$T.\ F.$ = tractive force.
$B.\ P.$ = boiler pressure.
R_1 = the internal resistance from formula of Dr. Goss.
R_2 = O.
R_3 = internal resistance as taken from Henderson's formula.
R_4 = resistance of the machinery internal in the engine as determined by the St. Louis tests.
P_1 = M. E. P. from tests made.
P_2 = M. E. P. from tests made, less 8.5 per cent. for friction as recommended by Henderson.
P_3 = available force, taken from Henderson.
D = diameter of drivers.
d = diameter of cylinders.
s = stroke.
$C_1 = \frac{d^2 s}{D}$, a constant for each locomotive.
C_2 = tangential factor with P_3.

II. TRAIN RESISTANCE.

If the amount of resistance caused by a car in rolling along the track were well known and a formula of unquestionable accuracy, well checked and accepted, were available, it would be a simple matter to determine the tonnage rating of any locomotive from the tractive power. Unfortunately there is very little agreement among authorities and less among experimenters in regard to the exact value of this important factor. One thing alone is definite and that is the general inclination of the curves, giving an increased value for higher speeds. When the values obtained from tests actually cover a diagram, it is evident that there must be other items influencing the variation, other than the speed, and in order to determine what these items are and how much they influence the values, a careful analysis must be made. The factors which go to make up the resistance of cars in a moving train are many and difficult of determination. In general they may be classified as follows:

1. Acceleration.
2. Grade.
3. Friction; divided as follows:
   (a) Journal friction.
   (b) Rolling "
   (c) Flange "
   (d) Air "

There is such an accumulation of data upon each of the several items above mentioned and careful investigations differ so widely in their conclusions, it is evident that one would not be justified in making extended investigations for minute discriminations. Each factor was therefore investigated in so far as that investigation promised to be fruitful of information of value.

(1.) *Acceleration.*—The figures given by Wellington were

*"Economic Theory of Railway Location." A. M. Wellington.

adopted in the computations as an average representing a fairly well selected value for ordinary conditions.

(2.) *Grade.*—Grade resistance in pounds per ton is equal to 20 times the rate of grade in percentage, this being an accepted rule credited to Wellington.

(3.) *Friction.*—(a) Journal friction depends upon the design of the journals and lubrication, and varies with the number of journals and the pressure upon them. Speed does not materially affect this factor after it reaches that value at which a continuous film of oil is kept running between the surfaces in contact.

3 (b.) Rolling friction is the friction caused by the wheels in contact with the rail as if there were no flanges. It is generally conceded to be due to a peculiar wave in front of the rail just in front of the wheel, which depresses the track with its weight and therefore would vary as the weight upon the wheels and the condition of the roadbed. The size and shape of the rail and the size of the wheel would also affect this factor, together with other minor influences such as line, surface, snow and dirt.

3 (c.) The term "flange friction" denotes all other resistances between the wheel and the rail not included in the rolling resistances. On level tangent this factor is largely dependent on design of the rail and flanges.

3 (d) Air friction. Besides increasing the flange resistance (as when a wind is blowing against the side of a train) the friction of the air against the sides and suction at the back of the cars would increase the total resistance somewhat.

For miscellaneous factors seemingly impossible of determination the term "oscillation and concussion" is used. The hundred or more train resistance formulas may be arranged into four general forms, all of which deal only with frictional resistances, constants being used for journal friction and for the remaining resistance; sometimes exclusive of wind friction which is given as a separate factor varying as the square of the speed. A very few formulas take into consideration the size of the train, but even these do not mention the size of car-bodies and wheels, or the number of wheels to the car.

That these items might reasonably be expected to influence the resistance is evident from the way in which rolling stock has been changing, in weight and other dimensions, during the years producing train resistance formulas. The practice of simply plotting the train resistance values against the speed, as if that was the only factor influencing the variation, is unreasonable in light of these other changing factors. To determine the proportion of the variation of the train resistance, due solely to changing speed, a coefficient of correlation of the two variations could be made and a mathematical determination of the reasonableness of the practice referred to, computed. For this purpose results from dynanometer tests taken upon test trains of uniform size and conditions of design have been obtained and complete information made available. The speed as a factor in the variation of the train resistance was shown to influence only about 45 per cent. of that variation.

Among other factors doubtless an important influence would be made by the varying weight of the trains and the number of wheels carrying the weight. To determine the amount of this influence a number of test records made at or near the speed of 10 miles per hour were selected and studied. The values obtained were then correlated with the corresponding values of the weight of the train divided by the number of wheels carrying the load, the results proving that for these tests of especially uniform character the correlation was 96 per cent. For heterogeneous conditions the increasing number of other factors would reduce this figure correspondingly, but the fact is apparent that of the 55 per cent. remaining influence in the variation, the weight upon the "wheel units" is an important factor. It is obvious that all those factors which are derived from the contact of the rail with the wheels will vary with the number of wheels. From a study of all that has been done to determine this factor it may be stated, that, generally speaking, the journal friction will vary directly as the number of wheels.

There is evidence that the rolling resistance in pounds per ton is not increased when a truck contains six wheels instead of four. The rolling resistance caused by the elastic wave in front of the wheels is materially less for two trucks of six than for trucks of three or four wheels each, since the wave made by the first wheel affects the second only slightly and hence two instead of three waves will be made. The rolling resistance would reasonably vary inversely as the number of wheels in the truck.

Under normal conditions on a straight level track flange friction is no doubt much less in two six-wheel trucks, since the alinement and rigidity favor reduced friction. The same might be said of oscillation, concussion and other miscellaneous friction factors. On curves the resistance will also be much less, for the number of flanges cutting the rail will be less. Taking a general view of the matter it may be stated that rail resistances vary in pounds per ton, inversely as the number of wheels carrying the load.

Applying these two principles in a preliminary way to two of the most famous and well established formulas for train resistance, a reconciliation is found that shows both may be right. They were both derived from experiments made on good track, under practically the same circumstances, and while ranges of speed were not wide, they have been extended experimentally and substantially checked throughout. It has been stated that there were 5,000 experiments made from which the present "Baldwin Locomotive" formula was derived, the records unfortunately not having been preserved. These experiments, however, were made on 12-wheel high speed passenger cars. The formula is usually written as follows:

$$R = 3 + \frac{V}{6}$$

Adjusting this for 8-wheel freight cars, the first factor is reduced by the ratio of 12 to 8 and the second increased by the same ratio, hence it becomes,

$$R = 2 + \frac{V}{4}$$

which is the celebrated *Engineering News* formula.

The numerous charges that these formulas are based upon figures derived from tests on track, "some of which are the best in the world" and do not represent ordinary practice, have not been justified in the light of later experiments. In fact, later formulas give even lower values and the evidence that these are too low grows less as improved rolling stock and better road conditions are more common. The older the formula, generally speaking, the higher the values obtained by its use.

Considering this practical reconciliation the "wheel unit" of the type of freight car in use would present a practical basis. A number of references have been made to the importance of this wheel unit, Mr. Delano stating that, "the number of wheels and the length of the train are important factors," in train resistance. It might be possible to reduce all present formulae, as in the above case, to the freight car unit, or even to the basis of the number of wheels and the weight on them. It is safer, however, to use the data from which these formulae were derived, with this basis for a closer comparison than to take the mean adopted by the observer or the computer.

A correction must be made for "empties." What shall it be? The term "loaded" is only comparatively indicative of the weight of a car. A number of points enter in because of the relative weights of cars and of empty and loaded cars of early days, as compared with modern cars. It has been contended that the grade over which the empties were pulled should enter as a factor in the allowance, also the speed and the location in the train. Upon the "wheel unit" basis it is evident that the foregoing factors are all taken care of and

allowance of unknown quantity will not be necessary in such cases.

Extreme conditions, such as excessively long, heavy trains, or very light, short trains, will inevitably lead to different results, as the factors of oscillation and concussion and the averaging effect of long trains, as well as the effect of locomotive momentum and resistance, greatly increase or diminish as the size of the train changes. It is a lamentable fact that there is little reliable data regarding the resistance of trains in starting. Wellington's "starting curve" seems to have been well checked in some experiments, but is shown to be considerably off in many others. The conditions surrounding the experiments would probably account for the widest differences.

If the several factors above itemized be added together for average conditions, the result will be a justification of previous experiments or formulae falling within that range. To make a complete comparison of train resistance formulas would require a volume in itself, but sufficient evidence has been produced, it is thought, to justify the adoption of the derived values. As a general average for heavy freight trains it may be said that the *Engineering News* formula gives results very close to representing the actual resistance. The conclusion reached by the Committee of Economic Railway Location of the American Railway Engineering and Maintenance of Way Association, is, that the resistance should be determined for each road by tests, on account of the many variable factors.

The locomotive resistance, after the internal friction is deducted, will be found less in pounds per ton than that of the cars. This is due to the increased size of the wheels and decreased number in proportion to the weight. The majority of tests of locomotive friction have been made with steam shut off and coasting, which condition involves numerous internal forces of resistance. Upon deducting the amount of internal friction from the total thus found, it will appear that there is less "train resistance" in the locomotive than is usually allowed. Wickhorst states that the resistance of a locomotive "is equal to that of an empty car." This includes the internal friction, however, and is deduced from coasting tests. Deducting the internal friction, the curve resulting is found below the average of train resistance. If the "internal friction" is provided for in the computation of tractive force, it should not be included in the train resistance.

In the light of the foregoing the subject of the allowance for empty cars becomes simple and in general the conditions will give about 20 per cent. higher value for empty cars. This result appears to agree well with the results of numerous tests and conclusions from other investigations. The allowance is generally made, however, in the final rating and in this case would require simply that the rating given or remaining should be reduced one-fifth to allow for increased resistance of empty cars. The Santa Fe, as shown in its tonnage booklet, allows about 14 per cent. for very heavy trains. The C., B & Q. uses 23 per cent., which is the same as that employed on the Montana division of the Northern Pacific. From an investigation made by the American Railway Master Mechanics Association it was found that two roads use 25 per cent., several 20 per cent., three 10 per cent. and one eight per cent. for empty cars. Mr. Haas, in the *Railroad Gazette*, Vol. 27, 1895, p. 129, presents a method for determining this reduction by experiment and in his illustration gives a deduction of about 24 per cent. The difficulties lie in the difference in weights of cars and condition of track. The rotative energy, moreover, of the wheels in the train of empties is 4 or 5 per cent. higher for loads, owing to the increased number of wheels. This would probably reduce the higher values and give an average about that here adopted.

III. TONNAGE RATING.

The amount of the resistance in pounds per ton divided into the tractive force gives the tonnage a given locomotive will be able to haul. The determination depends upon the ruling grade on the division and the constant speed adopted as a minimum over grades. Usually this is taken as 10 miles per hour on the "drag grade," but for the purpose of this investigation the drag tonnage for all grades and speeds, from the lowest to the highest in ordinary use, were computed.

Since the tonnage rating depends upon those factors adopted and already discussed, it is evident that any comparison with other ratings depends entirely on the compensating influence of some high values for other lower ones. Some investigators might use a high value of m.e.p. and a corresponding high resistance or a low journal resistance and a compensating higher speed resistance factor. Sufficient evidence has been found, from a comparison of work done by investigators in the subject of locomotive rating, that the rating of the computation represents a fair average for locomotives of the types selected and a foundation is laid for the final adjustment of this rating for increased time.

IV. OPERATION.

(*a*) *Speed Rating.*—In the adjustment of the tonnage for increase of time many suggestions have been made, based, for the most part, on the experience of train dispatchers or operating officers. These adjustments, however, vary widely in amount and in manner of application.

In a discussion of locomotive rating before the Western Railway Club, Mr. Crawford gave a system for dividing the rating into four classes of A, B, C and D, the total difference being that in percentage of the "A" class, which was given a value of 100. This then gave B = 92.5; C = 85, and D = 70. These he states are used as follows:

Temperature above 40° × A
40° to 20° × B
20° to 10° × C
Below 10° × D

Mr. Crawford explains further that "these percentages are founded on data obtained on one of the divisions, the ratings being based on speed instead of grade." When asked as to the increase of speed due to momentum he states that, "the speed would be materially increased over the grades only, consequently the total reduction of time would depend on the number and rates of grades."

It is evident, however, that up to the point of maximum allowable speed, any reduction of tonnage would affect a corresponding reduction of time on any grade or level track and hence, while the greatest salvage may be made on the heaviest grades, it cannot be considered that there is no increase over the level portions. It appears necessary, therefore, that the actual running time for trains of different tonnage should be taken as a basis for this determination, and hence the method to be employed is as follows:

(a) The operation of the trains of tonnage for ruling grades, up to about 0.6 per cent. for all speeds from 10 to 35 miles per hour as above found, were analyzed and the running time for a given profile determined.

(b) Given the running time for trains of different tonnage by the construction of a curve, and, by interpolation, the tonnage for selected intervals of time saved was found.

(*b*) *Speed-time computations.*—The numerous systems of computation suggested and used for the operation of trains over profiles are for the purpose of converting the speed into "velocity head" or, as proposed by Wellington, "potential lift," and from the difference of head at different speeds the remaining items are computed.

The velocity head, or distance a body would fall to acquire a certain speed, is found to be independent of the weight. Expressed in units of head and feet and speed in miles per hour, according to Wellington, it is,

$$h = 0.033445\ V_2$$

and adding 6.14 per cent. for rotation of wheels, axles, etc.,

$$h = 0.0355\ V_2$$

This being worked out is given in Table II; the difference for increments of two miles per hour being also tabulated for convenience of further work.

A given variation of velocity head will require a proportional accelerating force. Expressed in pounds per ton.

$$\frac{P}{2{,}000} = \frac{h_2 - h_1}{S}, \text{ or}$$

$$S = \frac{2{,}000}{P}(h_2 - h_1)$$

The distance then, in which this acceleration would be accomplished, could be found by substitution in the above formula, but for convenience the force will be expressed in "equivalent grade," and the distance in stations of 100 ft. Since the force of gravity is equal to 20 times the rate of grade, the "equivalent grade" × 20 should be substituted for P, and 100 × S for S, in the above formula, giving then

$$S = \frac{h_2 - h_1}{E.\ G.}$$

or, the distance in stations required for any acceleration is equal to the difference of velocity head divided by the equivalent grade. The time which will be consumed in this distance will be found at once by dividing the distance just found by the speed in stations per minute. This last item of speed is tabulated in column 3 of the computation table, together with the train resistance and the tractive force taken from the results of the above investigations.

Referring to Table III, the following steps are taken to compute the operation on grades and at various speeds up to 50 miles per hour:

Column 1 and column 2 give the speeds in miles per hour, while column 3 gives the speeds in stations of 100-ft. per minute, corresponding to the odd values in column 3.

Column 4 is the tractive power of the engine for the speeds shown, taken as an average as above indicated, and column 5 the same in pounds per ton.

Column 7 is the train resistance in pounds per ton and column 6 the algebraic difference between columns 5 and 7. This difference gives the "net force" which is available for acceleration over and above that necessary for the resistances included in column 7.

The equivalent grade is found by dividing column 7 by 20. This is recorded in column 85 and will be plus or minus, as the net force is negative or positive.

The algebraic sum of this series of values and the actual grades given at the head of the 30 columns on each side of column 85, will give the new equivalent grade for each of these actual grades and is accordingly placed in the columns with the heading "Equivalent Grade."

The difference of "Velocity Head" is given in column 9 and it follows from the formula derived, that if this be divided by the equivalent grade, the corresponding distance in stations is at once obtained. This is recorded in the columns having the heading "Partial Stations" and represents the distance required for that change of speed.

When the values of these partial distances are divided by the speed in column 3 the corresponding time is obtained. This is recorded in the columns marked "Partial Time" and the values represent the time required by the train to run those distances at those speeds.

These partial quantities are next added together, accumulating from the top if the speed is accelerating, or from the bottom of the column when the "Equivalent Grade" is plus, which indicates the condition of retardation.

For all "Drag Trains" considered tables of this kind have been made, but are not shown here because of their size. It is evident that the operation has been worked out for changes of speed of two miles per hour with the assumption that the speed for that slight increment is practically constant in its increase or decrease, which is very nearly true in most cases. If the computation were based on intervals of one mile per hour the differences in the result would be very slight and the quantity of work would be doubled. The results are plotted diagrammatically in each case, as shown in Fig. 1, the diagrams being constructed with the speed in miles per hour against the distance in stations and also to the same scale, the speed against the time in minutes.

Diagrams thus derived show in an interesting way the acceleration and retardation of trains of tonnage varying from very light to very heavy for all grades from + 1.5 per cent. to—1.5 per cent. and all speeds up to 50 miles per hour, and for all three classes of locomotives. A convenient arrangement of the curves is seen in the placing of the "Time-Speed" series over the "Distance-Speed" series corresponding, the increments of speed being easily spaced off and the corresponding features readily found.

V APPLICATION.

(*a*) *Profile.*—In order to determine the saving of time due to reduction of tonnage the second division of the Wisconsin Central from Fond du Lac to Abbottsford, Wis., was taken as representing a typical Wisconsin railway with considerable stretches of level track and numerous hills and momentum runs. These latter are especially interesting in an investigation of this kind, since the entire range of the computations may be used. The curves are compensated for at 0.05 per degree and hence the only additional computation necessary is the adjustment of the actual profile for the curves. With these adjustments made and tabulated the theoretical running time may readily be computed for any train.

(*b*) *Theoretical Running Time.*—Given any locomotive with drag train selected, the operation over a profile is at once derived by applying the data at hand. As the train starts from rest and proceeds the given number of stations on the first grade, the corresponding speed is obtained from the diagram and carrying this speed up to the curve of the same grade in the time diagram the required number of minutes is found. This is placed in a column prepared for it and the next increment is found in a similar manner, only the last speed just found is used as the initial speed in this instance and the time increment between the two speeds is recorded. In case the grade is the ruling one and the speed assumes a constant value the time consumed is easily computed from the value in column 3 of the computing table.

In this way all the trains are run in both directions over the entire profile and the theoretical running time is found for operation in both directions. Care is taken to see that the stops are made at all points requiring such and that the speed does not exceed the limit of safe operation. These increments are finally added together and the totals recorded at the ends of the columns.

TABLE 1.—*Steam Capacity.*

Items	Class A.	Class B.	Class C.
(1) Heating surface	1,642.90	2,601.00	2,492.00
(2) Evap'rat'n per sq.ft. pr hr	12.5	17.00	14.00
(3) Tot'l lbs. pr hr [(1)x(2)]	20,540	44,250	34,900
(4) Cu. ft. per lb. at 212° F..	26.60	26.60	26.60
(5) Cu.ft. per hr. [(3)x(4)]	546,000	1,176.000	928,000
(6) Boiler pres. lbs. per sq.in.	145	200	200
(7) Cu.ft. steam at boiler pressure [14.7÷B. P. x (5)]	55,300	86,400	68,200
(8) Cu.ft. per lb. at B. P....	3,107 00	2,294.00	2,294.00
(9) Cu. ft. evaporat'n at B. P. [(7) ÷ (8)].....	17,800	37,650	29,700
(10) Pressure at cylinders....	122.5	169.2	169.2
(11) Cu. ft. per lb. at C. P....	3,641	2,690	2,690
(12) Cu.ft. per hr.[(9) x (11)]	64,800	101,400	80,100
(13) Evap. per sq. ft. heating surface per hr. at B. P. [(9) ÷ (1)]	10.88	14.48	11.95
(14) Cu. ft. pr min.[(12)÷60]	1,080.00	1,690.00	1,335.00
(15) Cu.ft. volume of cylinders per revolution	17.08	21.00	19.10
(16) Revolutions per min.....	63.3	80.5	69.9
(17) Factor of reduction.....	.5335	.5897	.5897
(18) Miles pr hr [(16)÷(17)]	11.85	13.65	11.88

(*c*) *Time-Tonnage Curves.*—Having now found the variation of time for corresponding variation of tonnage the desired result is obtained. The effect on the average speed is shown in Fig. 2. From this diagram (Fig. 2) by interpolation any necessary deduction of tonnage may be found at once for a corresponding desired saving of time.

TABLE 2.—TABLE OF TRACTIVE FORCES FOR CLASS "C" LOCOMOTIVE.

Constants: C_1, 165.0; C_2, 164.2; B. P., 200 lbs. sq. ft.; R_1, 627 lbs.; R_4, 1,500 lbs.

Speed.	MEP. B.	HYP. O.	P_1 B x B. P.	P_2 P. x .915.	P_3 O. x B.P.	R_3 $P_1C_1xH.R_3$.	P_1C_1-R (T. F.)$_1$.	P_2C_2-O (T. F.)$_2$.	$P_1C_1-R_3$. (T. F.)$_3$.	$P_1C_1-R_4$. (T. F.)$_4$.	P_2C_2-O (T. F.)$_5$.
0 miles per hr.	88.8	81.2	177.6	162.6	162.4	2,345	28,683	26,880	26,965	27,810	26,710
5 " " "	86.8	79.5	173.6	159.0	159.0	2,365	28,043	26,270	26,305	27,170	26,130
10 " " "	81.2	78.0	162.4	148.8	156.0	2,380	26,173	24,720	24,420	25,300	35,650
15 " " "	66.0	69.5	132.0	120.8	138.0	1,908	21,173	19,950	19,892	20,300	22,680
20 " " "	45.5	52.2	91.0	83.2	104.4	1,350	14,383	13,730	13,660	13,510	17,170
25 " " "	35.6	41.7	71.2	65.2	83.4	1,086	11,123	10,760	10,664	10,250	13,700
30 " " "	30.6	34.8	61.2	56.0	69.6	957	9,473	9,230	9,143	8,600	11,420
35 " " "	27.9	29.8	55.8	51.1	59.6	897	8,583	8,420	8,313	7,710	9,780
40 " " "	26.0	26.1	52.0	47.6	52.2	857	7,953	7,850	7,722	7,080	8,560
45 " " "	24.9	23.2	49.8	45.6	46.4	843	7,603	7,520	7,387	6,730	7,620
50 " " "	34.0	20.9	48.0	43.9	41.8	832	7,293	7,250	7,088	6,420	6,870
55 " " "	23.6	19.0	47.2	43.2	38.0	837	7,153	7,120	6,943	6,280	6,240
60 " " "	23.2	17.4	46.4	42.5	34.8	842	7,033	7,020	6,814	6,160	5,720

TABLE 3.—CLASS A, DRAG TRAIN 792, FOR .60 PER CENT. GRADE AT SPEED OF 15 MILES PER HOUR.

Speed, mean.			Tractive power			Train resistance,	Velocity head.		−1.50 per cent.				−0.0 per cent.				+ 1.50 per cent.				
										Distance		Time		Distance		Time		Distance		Time	
Miles, per hr.	Miles. per hr.	100 ft. Sta. per min.	Tractive power, lbs.	Lbs. per ton.	Net F. lbs., ton.	lbs., per ton.	Total, ft.	Diff., ft.	Equiv. grade, per cent.	Partial Sta.	Total, Sta.	Partial min.	Total, min.	Equiv. grade, per ct.	Part'l Sta.	Total Sta.	Part'l min.	Total min.	Equiv. grade, per ct.	Part'l Sta.	Total Sta.	Part'l min.	Total min.
0	..	..	..	..	..	..	0.00	..	..	..	..	..	..	..	..	..	..	..	..	..	63.50	..	3.95
..	1	0.88	20,000 lbs.	25.3	17.3	8.0	..	0.14	—2.36	0.06	..	0.07	..	—0.86	0.16	..	0.18	..	+ 0.64	—0.22	..	0.25	..
2	..	..	..	..	..	..	0.14	..	..	..	0.06	..	0.07	..	..	0.16	..	0.18	..	..	63.28	..	3.70
..	3	2.64	19,900 "	25.1	19.9	5.2	..	0.43	—2.49	0.17	..	0.06	..	—0.99	0.43	..	0.16	..	+ 0.51	—0.84	..	0.32	..
4	..	..	..	..	..	..	0.57	..	..	..	0.23	..	0.13	..	..	0.59	..	0.34	..	..	62.44	..	3.38
..	5	4.40	19,500 "	24.6	20.0	4.6	..	0.71	—2.50	0.28	..	0.06	..	—1.00	0.71	..	0.16	..	+ 0.50	—1.42	..	0.32	..
6	..	..	..	..	..	..	1.28	..	..	..	0.51	..	0.19	..	..	1.30	..	0.50	..	..	61.02	..	3.06
..	7	6.16	19,200 "	24.3	19.8	4.5	..	0.99	—2.49	0.40	..	0.06	..	—0.99	1.00	..	0.16	..	+ 0.51	—1.94	..	0.32	..
8	..	..	..	..	..	..	2.27	..	..	..	0.91	..	0.25	..	..	2.30	..	0.66	..	..	59.08	..	2.74
..	9	7.92	18,500 "	23.4	18.8	4.6	..	1.28	—2.44	0.52	..	0.07	..	—0.94	1.36	..	0.17	..	+ 0.56	—2.29	..	0.29	..
10	..	..	..	..	..	..	3.55	..	..	..	1.43	..	0.32	..	..	3.66	..	0.83	..	..	56.79	..	2.45
..	11	9.68	17,500 "	22.1	17.3	4.8	..	1.56	—2.36	0.66	..	0.07	..	—0.86	1.81	..	0.19	..	+ 0.64	—2.44	..	0.25	..
12	..	..	..	..	..	..	5.11	..	..	..	2.09	..	0.39	..	..	5.47	..	1.02	..	..	54.35	..	2.20
..	13	11.44	15,600 "	19.7	14.4	5.3	..	1.85	—2.22	0.83	..	0.07	..	—0.72	2.57	..	0.22	..	+ .078	—2.37	..	0.21	..
14	..	..	..	..	..	..	6.96	..	..	..	2.92	..	0.46	..	..	8.04	..	1.24	..	..	51.98	..	1.99
..	15	13.20	14,000 "	17.7	11.9	5.8	..	2.13	—2.09	1.02	..	0.08	..	—0.59	3.61	..	0.27	..	+ 0.91	—2.35	..	0.18	..
16	..	..	..	..	..	..	9.09	..	..	..	3.94	..	0.54	..	..	11.65	..	1.51	..	..	49.63	..	1.81
..	17	14.96	12,200 "	15.4	9.1	6.3	..	2.41	—1.95	1.24	..	0.08	..	—0.45	5.36	..	0.36	..	+ 1.05	—2.30	..	0.15	..
18	..	..	..	..	..	..	11.50	..	..	..	5.18	..	0.62	..	..	17.01	..	1.87	..	..	47.33	..	1.66
..	19	16.72	10,400 "	13.1	6.3	6.8	..	2.70	—1.81	1.49	..	0.09	..	—0.31	8.75	..	0.52	..	+ 1.19	—2.27	..	0.14	..
20	..	..	..	..	..	..	14.20	..	..	..	6.67	..	0.71	..	..	25.76	..	2.39	..	..	45.06	..	1.52
..	21	18.48	9,300 "	11.7	4.4	7.3	..	2.98	—1.72	1.73	..	0.09	..	—0.22	13.5	..	0.73	..	+ 1.28	—2.33	..	0.13	..
22	..	..	..	..	..	..	17.18	..	..	..	8.40	..	0.80	..	..	39.26	..	3.12	..	..	42.73	..	1.39
..	23	20.24	8,500 "	10.7	2.9	7.8	..	3.27	—1.64	2.00	..	0.10	..	—0.14	23.3	..	1.15	..	+ 1.36	—2.40	..	0.12	..
24	..	..	..	..	..	..	20.45	..	..	..	10.40	..	0.90	..	..	62.5	..	4.27	..	..	40.33	..	1.27
..	25	22.00	7,800 "	9.85	1.5	8.3	..	3.55	—1.57	2.26	..	0.10	..	—0.07	50.8	..	2.31	..	+ 1.43	—2.48	..	0.11	..
26	..	..	..	..	..	..	24.00	..	..	..	12.66	..	1.00	..	..	113.4	..	6.58	..	..	37.85	..	1.16
..	27	23.76	7,200 "	8.10	0.4	8.7	..	3.83	—1.52	2.52	..	0.11	..	—0.02	91.0	..	8.05	..	+ 1.48	—2.60	..	0.11	..
28	..	..	..	..	..	..	27.83	..	..	..	15.18	..	1.11	..	..	42.9	..	14.36	..	..	35.25	..	1.05
..	29	25.52	6,800 "	8.60	—0.6	9.2	..	4.12	—1.47	2.80	..	0.11	..	+ 0.03	—137	..	5.38	..	+ 1.53	—2.58	..	0.11	..
30	..	..	..	..	..	..	31.95	..	..	..	17.98	..	1.22	..	..	29.2	..	8.98	..	..	32.67	..	0.94
..	31	27.28	6,500 "	8.20	—1.5	9.7	..	4.40	—1.43	3.08	..	0.11	..	+ 0.07	—63.0	..	2.31	..	+ 1.57	—2.80	..	0.10	..
32	..	..	..	..	..	..	36.35	..	..	..	21.06	..	1.33	..	..	22.9	..	6.67	..	..	29.87	..	0.84
..	33	29.04	6,200 "	7.84	—2.4	10.2	..	4.69	—1.38	3.40	..	0.12	..	+ 0.12	—39.0	..	1.34	..	+ 1.62	—2.89	..	0.10	..
34	..	..	..	..	..	..	41.04	..	..	..	24.46	..	1.45	..	..	189.9	..	5.33	..	..	26.98	..	0.74
..	35	30.80	6,000 "	7.58	—3.0	10.6	..	4.97	—1.35	3.69	..	0.12	..	+ 0.15	—33.1	..	1.07	..	+ 1.65	—3.02	..	0.10	..
36	..	..	..	..	..	..	46.01	..	..	..	28.15	..	1.57	..	..	156.8	..	4.26	..	..	23.96	..	0.64
..	37	32.56	5,800 "	7.32	—3.8	11.1	..	5.25	—1.31	4.01	..	0.12	..	+ 0.19	—27.6	..	0.85	..	+ 1.69	—3.11	..	0.10	..
38	..	..	..	..	..	..	51.26	..	..	..	32.16	..	1.69	..	..	120.2	..	3.41	..	..	20.85	..	0.54
..	39	34.32	5,650 "	7.13	—4.4	11.5	..	5.54	—1.28	4.33	..	0.13	..	+ 0.22	—25.2	..	0.74	..	+ 1.72	—3.23	..	0.09	..
40	..	..	..	..	..	..	56.80	..	..	..	36.49	..	1.82	..	..	104.0	..	2.67	..	..	17.62	..	0.45
..	41	36.08	5,500 "	6.95	—5.1	12.0	..	5.82	—1.25	4.66	..	0.13	..	+ 0.25	—23.2	..	0.64	..	+ 1.75	—3.33	..	0.09	..
42	..	..	..	..	..	..	62.62	..	..	..	41.15	..	1.95	..	..	80.8	..	2.03	..	..	14.29	..	0.36
..	43	37.84	5,400 "	6.82	—5.7	12.5	..	6.11	—1.22	5.00	..	0.13	..	+ 0.28	—21.8	..	0.58	..	+ 1.78	—3.43	..	0.09	..
44	..	..	..	..	..	..	68.73	..	..	..	46.15	..	2.08	..	..	59.0	..	1.45	..	..	10.86	..	0.27
..	45	39.60	5,300 "	6.70	—6.3	13.0	..	6.39	—1.19	5.36	..	0.14	..	+ 0.31	—20.6	..	0.54	..	+ 1.81	—3.53	..	0.09	..
46	..	..	..	..	..	..	75.12	..	..	..	51.51	..	2.22	..	..	38.4	..	0.91	..	..	7.33	..	0.18
..	47	41.36	5,200 "	6.58	—6.9	13.5	..	6.67	—1.16	5.74	..	0.14	..	+ 0.34	—19.6	..	0.47	..	+ 1.84	—3.62	..	0.09	..
48	..	..	..	..	..	..	81.79	..	..	..	57.25	..	2.36	..	..	18.8	..	0.44	..	..	3.71	..	0.09
..	49	43.12	5,100 "	6.44	—7.5	13.9	..	6.96	—1.13	6.15	..	0.14	..	+ 0.37	—18.8	..	0.44	..	+ 1.87	—3.71	..	0.09	..
50	..	..	..	..	..	..	88.75	..	..	..	63.40	..	2.50	..	..	..	..	..	..	..	..	..	..

The time consumed in stopping a train is not a matter which requires exact determination, since it seldom happens that the brakes are applied at exactly the moment at which they should be applied so the stop will occur exactly where it is desired, with full pressure acting constantly in retarding the train. Data upon the subject derived from numerous careful tests are given in a catalogue publication entitled "Westinghouse Air Brake Tests," and in general it may be stated that the results of these investigations go to show that there is a very wide range for this factor.

From a long series of tests all trains weighing over 500 tons gave as an average distance to stop from 30 to 40 miles per hour, from 302 ft., for an emergency application, to 1,753 ft. with hand brake. The average with air brake was about 800 ft. and the time consumed about 20 seconds. After investigating a number of speed records the fact was discovered that this value was under the average for operating conditions and it appeared that engineers slow down a considerable distance before the final application of brakes is made. In most instances this slowing down began about 1,500 ft. before the stop and the retardation was more or less regular from about 1,000 ft. to the stop. With passenger trains this is probably not as true as in the case of freight trains, but there is every evidence that modern practice is somewhat inclined toward this kind of operation. It is not improbable that if this speed is taken as decreasing constantly for the last 1,000 ft. that a figure representing the average stopping conditions would be obtained. As a general average it may be stated that the speed may be considered as decreasing uniformly for the last 500 to 1,000 ft., depending upon speed and size of train.

In the tests a speed indicator was used and a chronograph was devised to reduce the labor involved in the determination of the records obtained. The chronograph consisted of a clock attached to the speed recorder with a connecting mechanism so a pencil is drawn down the paper ribbon beside the speed pencil. When the train stops the paper ceases to move, a straight vertical line of given scale is drawn by the clock pencil showing the exact length of that stop. At the end of the run this record reveals the exact running time, which should check the theoretical time above computed for average conditions of operation.

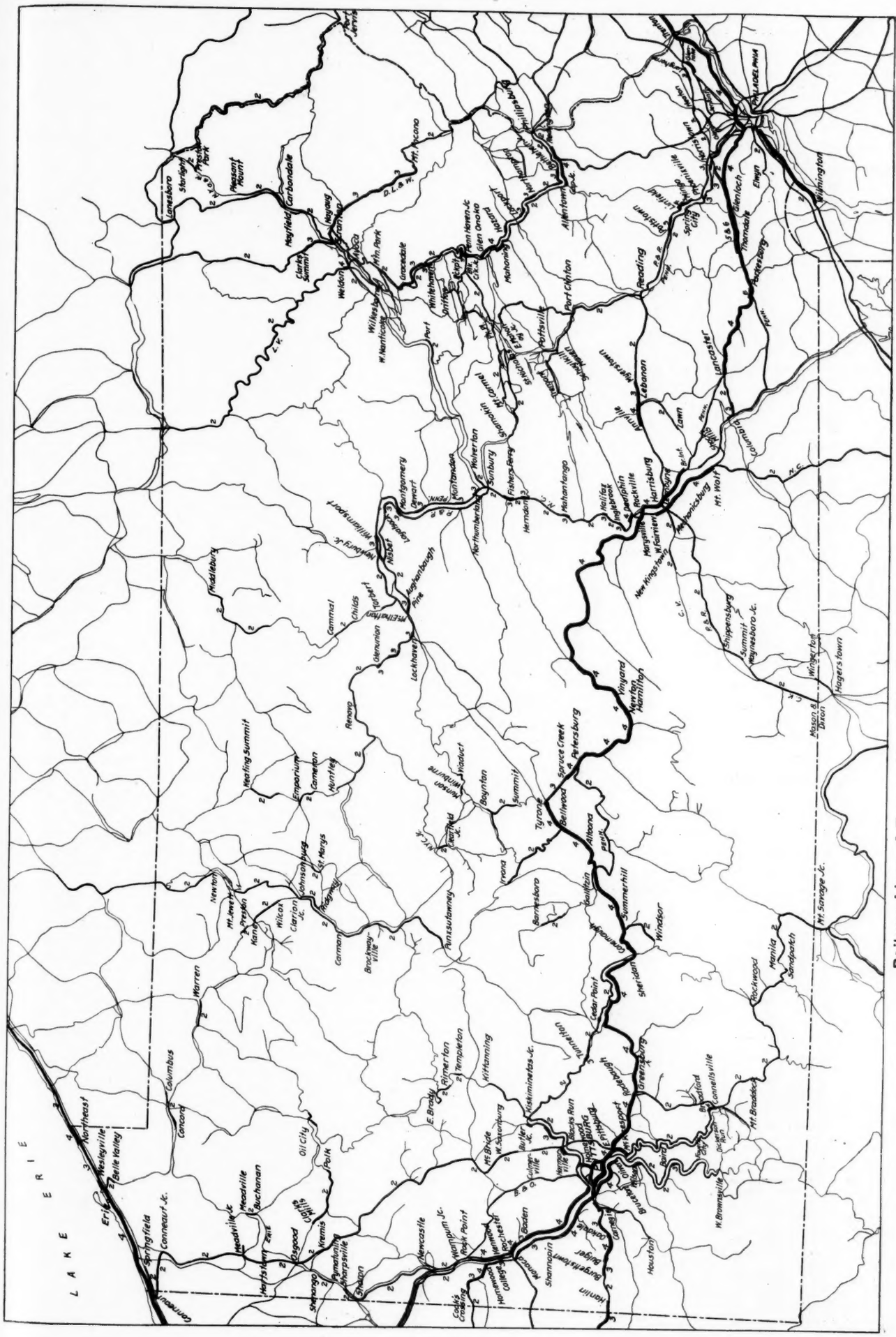
To C. N. Kalk, chief engineer of the Wisconsin Railway, the writer is indebted for these figures and data. The subject is big and it is hoped that this exposition of modern methods in research will develop further interest on other railways in this important factor in economics of railway engineering.

MULTIPLE TRACK RAILWAYS IN PENNSYLVANIA.

The map, given herewith, shows the two-track, three-track and four-track sections of the railways in the state of Pennsylvania. In consequence of the necessarily small scale of the drawing it has been impossible in the case of numerous short sections to show their situation graphically, and the reader will have to turn to the printed list. The termini of the sections are as follows:

PENNSYLVANIA.

	No. tracks.	Approx. miles.
**Baltimore & Ohio.*		
Philadelphia to Wilmington, Del.	2	25
Mt. Savage Jct., Md., to Manila	2	26
Sandpatch to Connellsville	2	60
Connellsville to Broadford	4	2
Broadford to McKeesport	2	40
McKeesport to Wheeling, Jct.	4	13
Wheeling Jct. to Pittsburgh	2	2
Green Jct. to Mt. Braddock	2	6
Rockwood to Wilson Creek Jct.	2	1
Rand to Bruceton	2	..
Allegheny to Haselton, O.	2	76
Bessemer & Lake Erie.		
Conneaut, O., to Osgood, Pa.	2	47
Osgood to Kremis	2	11
Kremis to Woods	2	67
Culmerville to E. Pittsburgh	2	20
Meadville Jct. to Exposition Park	2	2
Buffalo, Rochester & Pittsburgh.		
Carrolton, N. Y., to Newton	2	27
Clarion Jct. to Punxsutawney	2	59
Brockwayville to Carman	2	11
Central of New Jersey.		
Phillipsburg, N. J., to Bethlehem Jct.	2	12
Bethlehem Jct. to Allentown	3	5
Allentown to Northampton	2	6
Northampton to W. of Siegfried	3	1
West of Siegfried to Treichler	2	4
Treichler to Lockport	3	3
Lockport to East End Hazard	2	7
At Hazard	3	2
Hazard to Penn Haven Jct.	2	16
Penn Haven Jct. to Rockport	3	7
Rockport to Solomon's Gap	2	24
Mountain Park to Wilkesbarre	2	8
Gardner's Switch to Scranton	2	2
Cornwall & Lebanon.		
Lebanon to Lawn	2	14
Delaware & Hudson.		
Carbondale to Wilkesbarre	2	35
Delaware, Lackawanna & Western.		
Delaware, N. J., to Mt. Pocono	2	31
Mt. Pocono to Clark's Summit	3	41
Clark's Summit to Binghamton, N. Y.	2	55
Scranton to West Nanticoke	2	24
Erie.		
Port Jervis, N. Y., to Binghamton, N. Y. (Partly in New York)	2	127
Columbus to Concord	2	8
Shenango to Pymatuning	2	6
Sharpsville to Sharon	2	3
Mt. Jewett to Clarion Jct.	2	20
Nayaug to Avoca	2	11
Lanesboro to Carbondale	2	38
Lake Shore & Michigan Southern.		
Clark's Mills to Polk Jct.	2	15
State line to North East	4	5
North East to Wesleyville	3	11
Wesleyville to Conneaut, O.	4	32
Erie to Saybrook	4	45
Lehigh Valley.		
Phillipsburg, N. J., to Redington	2	7
Redington to Gap Jct.	4	10
Gap Jct. to Mahoning	2	26
Mahoning to Glen Onoko	4	6
Glen Onoko to Whitehaven	2	21
Whitehaven to Gracedale	3	13
Gracedale to Falling Spring	2	..
Falling Spring to Weldon	4	..
Weldon to Lockwood, N. Y.	2	91
Penn Haven Jct. to Park Place	2	25
Barry Jct. to Mt. Carmel	2	15
Black Creek Jct. to Silver Brook Jct.	2	17
Lumber Yard to Drifton	2	..
New York, Ontario & Western.		
Scranton to Diamond Crossing	2	..
Jermyn to Mayfield	2	1
Carbondale to Pleasant Mount	2	13
Preston to Starlight	2	3
New York, Chicago & St. Louis.		
Springfield to Conneaut, O.	2	8
Northern Central.		
Sunbury to Selinsgrove Jct.	2	5
Selinsgrove Jct. to Fishers' Ferry	3	3
Fishers' Ferry to Herndon	2	4
Herndon	3	1
Herndon to Mahantango	2	9
At Mahantango	3	1
Mahantango to Halifax	2	11
At Halifax	3	1
Halifax to Inglenook	2	5
Inglenook to Clark's Ferry	3	2
Clark's Ferry to W. of Dauphin	2	5
W. of Dauphin to Dauphin	3	2
Dauphin to Rockville	2	3
Marysville to West Fairview	2	5
West Fairview to Mt. Wolf	4	21
Mt. Wolf to Md. State Line	2	29
Pennsylvania (m means main line).		
m. Trenton, N. J., to Philadelphia	4	33
N. Philadelphia to Chestnut Hill	2	8
m. Philadelphia to Lancaster	4	68
Lancaster to Mountville	2	8
Mountville to Columbia	3	5
Glen Loch to Heaton	2	30
At Heaton	3	2
Heaton to Roxton	2	7
Roxton to Langhorne	3	4
Langhorne to Morrisville	2	9
Glen Loch to Thorndale (Tracks 5 and 6 for freight.)	2	11
Parkesburg to Shocks Mills	2	43
Shocks Mills to Mt. Wolf	2	6
m. Lancaster to Branch Intersection	2	26
m. Branch Intersection to Spruce Creek	4	130
m. Spruce Creek to Tyrone	3	7
m. Tyrone to Pittsburgh (Includes a few short pieces of 3-track line.)	4	128
Columbia to Branch Intersection	2	20
West Philadelphia to Spring City	2	31
Spring City to Douglassville	2	12
Petersburg to Gallitzin	2	47
Summit to Boynton	2	8
Osceola Jct. to Goss Run Jct.	2	5
Bellewood to Irvona	2	24
Tunnel to E. of Burnesboro	2	..
Greensburg to Connellsville	2	25
Sheridan to Cedar Point	2	25
Cedar Point to Tunnelton	2	10
Tunnelton to Butler Jct.	2	33
Butler Jct. to Natrona	2	4
Natrona to Glassemere	3	4
Glassemere to E. of Denny	2	6
E. of Denny to Harmarville	4	1
Harmarville to Bennett	2	10
Bennett to Allegheny	3	2
At Allegheny	4	1
Radebaugh to County Home Jct.	2	3



Railway Lines of Two or More Main Tracks in the State of Pennsylvania.

	No. tracks.	Approx. miles.
Brilliant Cut-off	4	..
Pittsburg to Kiskiminetas Jct.	2	29
Pittsburg to Oliver	4	12
Oliver to Wilson	2	6
Wilson to S. of Clairton	4	2
S. of Clairton to Baird	2	13
Baird to Donara	3	2
Donara to W. Brownsville	2	18
Keating Summit to Sizerville	2	1
Oil City to Rockmere	2	4
Schenley to Kittanning	2	15
S. of Templeton to Grays Eddy	2	2
Rimerton to E. Brady	2	9
Erie to Belle Valley	2	6
Irvineton to Warren	2	6
At Preston	2	2
Kane to Wilcox	2	9
Johnsonburg to Ridgeway	2	8
St. Marys to Benzinger	2	5
Emporium to Cameron	2	5
Huntley to Renovo	2	32
Renovo to Glen Union	2	14
At Glen Union	3	5
Glen Union to Farrandsville	2	8
Farrandsville to Ferney	3	2
Farrandsville to Lock Haven	2	6
At Lock Haven	3	1
Lock Haven to W. of Pine	2	7
W. of Pine to Anghanbaugh	3	3
Anghanbaugh to Nisbet	2	10
Nisbet to Williamsport	3	6
Williamsport to Loyalsock	2	10
At Loyalsock	3	2
Loyalsock to Montgomery	2	6
At Montgomery	3	2
Montgomery to Dewart	2	4
Dewart to Watsontown	3	2
Watsontown to Montandon	2	8
At Montandon	3	1
Montandon to Northumberland	2	7
Northumberland	3	2
Northumberland to Sunbury	2	2
Nescopeck to Port	2	6
Sunbury to Wolverton	2	6
Pennsylvania Lines West of Pittsburgh; N. W. System.		
Pittsburgh to Allegheny	2	1
Allegheny to Baden	4	19
Baden to Freedom	3	3
Freedom to Rochester	4	2
Rochester to New Brighton	3	3
New Brighton to Homewood	3	20
Homewood to Walnut	4	
Walnut to Cook's Crossing	3	
Cook's Crossing to State Line	2	
Rochester to E. Liverpool, O.	2	19
Lawrence Jct. to New Castle	2	3
Lawrence Jct. to Sharpsville	2	26
Pennsylvania Lines; S. W. System.		
Pittsburgh to Birmingham	2	1
Birmingham to Sheridan	4	26
Sheridan to Idlewood	2	
Idlewood to W. of Carnegie	4	
W. of Carnegie	2	
W. of Carnegie to Oakdale	3	
Oakdale to Bulger	4	
Bulger to Burgettstown	3	
Burgettstown to Hanlin	2	5
Hanlin to State Line	3	3
Carnegie to Houston	2	15
Philadelphia, Baltimore & Washington.		
Philadelphia to Wilmington	4	27
Philadelphia to Elwyn	2	15
Wabash Pittsburgh Terminal.		
Pittsburgh to Rook Yard	2	4
Pittsburgh & Lake Erie.		
Pittsburgh to Shannopin	4	14
Shannopin to Monaca	3	9
Monaca to College	2	5
College to Rock Point	4	7
Rock Point to Lowellville Jct., O.	2	19
Pittsburgh to Homestead	4	7
Homestead to Dickerson Run	2	46
McKeesport to Fayette City	2	30
Western Maryland.		
Wingerton to State Line	2	1
Cumberland Valley.		
Lemoyne to Mechanicsburg	2	7
New Kingston to "Q. N." Tower	2	6
At Carlisle	2	2
Shippensburg to Greencastle	2	21
At Greencastle	3	2
Greencastle to Mason-Dixon	2	4
New York Central.		
Middlebury to D. I. Tower	..	..
Cammal to Childs	2	2
Torbert to Newbury Jct.	2	15
Jersey Shore Jct. to McElhattan	2	7
At Viaduct	2	..
Winburn to Munson	2	2
Clearfield Jct. to N. Y. C. Jct.	2	..
Philadelphia & Reading.		
Reading to Myerstown	2	22
Myerstown to Lebanon	3	7
Lebanon to Annville	4	4
Annville to Shippensburg	2	62
Wilburtha, N. J., to Glenlake	2	6
Glenlake to Janney	4	4
Janney to Philadelphia	2	22
Newtown Jct. to Neshaminy Falls	2	14
Philadelphia to Chestnut Hill	2	10
Jenkintown to S. Bethlehem	2	46
Glenside to Willow Grove	2	4
Philadelphia to Norristown	2	17
Philadelphia to Bridgeport	2	18
Bridgeport to Abrams	3	1
Abrams to Port Kennedy	2	3
Port Kennedy to Valley Forge	3	2
Valley Forge to Perkiomen Jct.	2	2
Perkiomen Jct. to Phoenixville	3	3
Phoenixville to Mingo	2	3
Mingo to Aramingo	3	3
Aramingo to Linfield	4	1
Linfield to Sanatoga	2	3
Sanatoga to Pottstown	3	3
Pottstown to Pottsville	2	53
Schuylkill Haven to Tremont	2	16
Port Clinton to E. Mahanoy Jct.	2	25
St. Nicholas to Shamokin	2	27
Sunbury to Newberry Jct.	2	46

ANALYSES AND BUYING OF STEAM COAL.

Part II of the report of the committee on fuel supply, Boston Chamber of Commerce, a portion of which report appeared in the *Railway Age Gazette* of May 13, considers the subject of analysis and buying of steam coal.

New England receives nearly all of its coal supply from the Northern Appalachian Field of Pennsylvania, Maryland, West Virginia and Virginia. This field is the richest and most extensive in the world, and contains all kinds of coal, from anthracite to bituminous or gas coal.

While all of the coal in this region was probably formed from similar kinds of vegetable matter, it has received somewhat different treatment from the hand of Nature in the various districts. Since the deposition of the coal beds the coal of some districts has been subjected to more intense heat and pressure than that of others, with the result that the volatile and gaseous constituents were driven off in varying degrees, thus forming almost every character of coal between anthracite with 5 per cent. volatile, and gas coal with 40 per cent. Outside the anthracite district the lowest volatile coal is found closest to the backbone of the Allegheny mountain range. To the northwest at right angles to the mountain ranges, the percentage of volatile in the coal gradually increases, but parallel to the ranges the volatile remains practically constant from the northern part of Pennsylvania to southern West Virginia. Therefore the geographical location of a mine closely indicates the character of the coal with respect to volatile, regardless of the seam from which it is mined.

The quality of coal with respect to ash and sulphur, however, often varies widely even in the same seam in the same district. The source of the ash and sulphur explains to a certain extent why they may be so variable. The original vegetable matter from which coal was formed contained some ash, and the greater part of this is still retained uniformly mixed throughout the coal. Water, carrying sediment and sand, washed over the coal-forming areas and from time to time deposited earthy matter, some of which is interspersed uniformly through the coal seams, but which often occurs in streaks of several inches in thickness; also water carrying mineral compounds in solution is continually percolating through the strata near the earth's surface and the coal seams, acting as filter beds, collect from it iron sulphide, or sulphur balls, lime compounds and other impurities. In mining coal, impurities such as slate and shale from the roof or floor of the mine may also get in. Some of the abovementioned impurities are so uniformly mixed through the coal that their elimination is impossible, while the amount of others found in the coal as shipped depends upon the care taken in mining and loading.

New England receives about 17,000,000 tons, or 70 per cent. of its total coal supply, from the State of Pennsylvania, approximately half of which is anthracite. Of the steam coal, about 9,000,000 tons, or 58 per cent., is from Pennsylvania, 5,000,000 tons, or 32 per cent., from West Virginia and Virginia, 1,000,000 tons, or 6 per cent., from Maryland, and 600,000 tons, or 4 per cent., from Nova Scotia.

ANALYSIS OF COAL.

It is very desirable to know before purchasing coal whether it is going to be suitable for its intended use. While the true test is in its burning, yet there are methods of deter-

mining its character and quality which give a reliable indication of what may be expected from it in use, and it is possible to go still further and specify the nature and quality of coal desired and determine whether or not such coal has been delivered. Probably the most practicable method of doing this is by chemical analysis and determination of heating value.

For many years the fuel used in metallurgical processes has been analyzed for the impurities that are detrimental to iron or steel, but it is only recently that the United States Government and some private steam coal users have taken up the systematic analysis of coal and purchased it on specifications.

The different constituents that are usually determined in coal are the moisture, volatile, fixed carbon, ash, sulphur, and heating value.

Moisture is determined by noting the loss of weight of a portion of the sample after it has been dried for an hour

Coal Map No.	DISTRICT	STATE	AUTHORITY	BULLETIN	Character of Sample	Number of Samples	Moisture	Volatile	Fixed Carbon	Ash	Sulphur	BRITISH THERMAL UNITS	
												As Received	Dry Basis
1	Tioga Co.,	Pa.	Commercial,	–	†Average	6	1 74	19.68	67 09	11 49	1 93	13599	13839
2	Anthracite, Buckwheat,	Pa.	U. S. G. S. & T	339	†Average	40	5 45	2.30	74.57	17.68	0.65	11305	11957
			Commercial,	–	†Average	108	3.24	5 81	74.52	16 43	0 90	11942	12342
			"		**Variation from		8 10	6 87	78 11	20.43	0 99	12441	12853
			"	–	**Variation to		1 95	2 30	71 03	12.92	0 61	10990	11653
2	Anthracite, Screenings,	Pa.	U. S. T.,	–	†Average	20	5 15	–	–	12 08	–	12401	13076
			Commercial,	–	†Average	37	3.18	5 61	78 85	12.36	0 82	12816	13237
3	Broad Top,	Pa.	Commercial,	–	†Average	84	0 71	15 84	72 95	10 50	1 78	13915	14015
			"	–	**Variation from		1.30	17 58	73 27	15 30	2.74	14123	14244
			"	–	**Variation to		0 48	14 12	66 32	8.96	1.02	13013	13132
4	Clearfield Co.,	Pa.	U. S. T.,	–	†Average	26	2 59	–	–	8 94	–	13962	14333
			Commercial,	–	†Average	159	2.39	20 47	67 41	9 73	2 02	13749	14086
			"	–	**Variation from		3.62	27 95	74 97	14.71	3.67	14517	14644
			"	–	**Variation to		.82	15 85	62 90	7.16	1 04	13142	13486
5	Cambria Co.,	Pa	U. S G. S. & T	290,332	†Average	69	2.53	17 44	72 60	7.43	1 15	14230	14600
			Commercial,	–	†Average	269	2 53	19.50	69.50	8.47	2.18	13961	14324
			"	–	**Variation from		4.23	25 92	77 23	13.00	4.60	14800	14942
			"	–	**Variation to		0 85	15 80	63.10	5.74	0.81	13143	13484
6	Somerset Co.,	Pa	U. S. G. S.,	261,290	†Average	5	2 18	16 42	71 76	9.64	1.70	13873	14182
			Commercial,	–	†Average	219	2.55	17.53	70.52	9.40	1 11	13873	14238
			"	–	**Variation from		3 97	21 89	74.64	12.86	2.13	14283	14437
			"	–	**Variation to		0.94	14.72	68 87	8.58	0.78	13159	13400
8	Jefferson Co.,	Pa.	Commercial,	–	†Average	44	1 54	30 35	58.55	9.56	2.22	13661	13875
10	Indiana Co ,	Pa.	U. S. G. S.,	332	†Average	7	2 95	22 12	63 93	11.00	3.10	13383	13790
			Commercial,	–	†Average	38	1 32	22 78	65.30	10.60	1.83	13861	14048
11	Westmoreland Co. (East'n part),	Pa.	U. S. G. S.,	290,332	†Average	24	3.25	31.08	55.22	10.45	1.64	13399	13849
14	Pittsburg,	Pa.	U. S. G. S.,	290,332	†Average	16	2.75	33.91	56.28	7.06	1.28	13864	14259
20	Georges Creek (Big Vein),	Md.	U. S. G. S.,	332,339	†Average	13	3.38	16.59	72.01	8.02	0.93	13960	14449
			Commercial,	–	†Average	186	3.02	18.58	69.93	8.47	1.02	13917	14350
			"		**Variation from		4.38	19.30	74.39	9.51	1 10	14493	14687
			"	–	**Variation to		0.79	16.54	69.59	7.08	0 86	13788	14235
21	Upper Potomac and G. C. Small Vein,	Md. and W. Va.	U. S. G. S.,	290	†Average	2	2.08	15.07	70.02	12.83	1.51	13341	13625
			Commercial,	–	†Average	114	2.75	20.16	67.02	10.07	1 05	13664	14051
			"		**Variation from		4 03	22.03	69.44	12.97	1.49	14185	14347
			"	–	**Variation to		1.22	17.05	63.68	8.53	0.86	13169	13541
22	Fairmont,	W. Va.	U. S. G. S.,	261,290	†Average	17	2 48	36.35	53.60	7.57	1.99	13813	14166
23	New River,	W. Va.	U. S. G. S.,	261 290,362	†Average	33	2.96	20.14	70.80	6.10	0.84	14321	14759
			Commercial,	–	†Average	362	2.98	20.47	70.21	6.34	0.99	14257	14696
			"		**Variation from		4.67	23 38	74.69	8.12	1.51	14864	15002
			"	–	**Variation to		0 91	18.38	69.33	5.03	0.73	13988	14418
24	Kanawha,	W. Va.	U. S. G. S.,	261,290,332	†Average	34	3 49	32 39	57 40	6.72	1.12	13809	14309
26	Pocahontas,	W. Va.	U. S. G. S.,	261,362	†Average	18	2 72	16.70	73.93	6.65	0.58	14481	14888
			Commercial,	–	†Average	100	2.86	17.59	72.40	7.15	0.70	14241	14661
			"		**Variation from		3.73	20.62	77.30	9.34	0.83	14901	15058
			"	–	**Variation to		0.70	15.49	70.59	5 24	0.59	13912	14322
28	Clinch Valley,	Va.	U. S. G. S.,	290,332	†Average	24	4.27	32.30	57 21	6.22	1 04	13755	14369
	Nova Scotia (¼ inch slack)		Commercial,	-	†Average	5	2.03	27 53	55 57	14.87	1 65	12406	12662
	Rhode Island,		U. S. G. S.,	332	†Average	1	2.41	4.92	73 61	19 06	0.07	10996	11267

ABBREVIATIONS:—U. S. G. S. For United States Geological Survey. U. S. T. For United States Treasury Department.

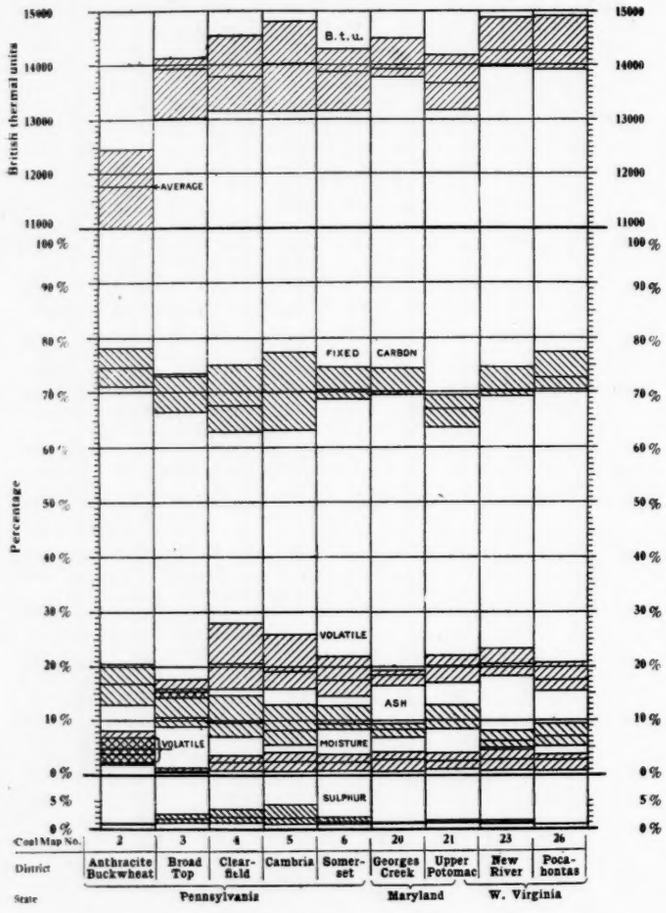
† Average. The figures opposite the word average in each district represent the average amount of all constituents in the number of samples designated—these figures will always total 100%, (exclusive of sulphur, which is included in the other constituents.)

** Variation {from / to} The figures opposite these words show respectively the highest and lowest per cent. of each constituent, independent of any others.

* Compiled from the Bulletins of the U S. Geological Survey; U S. Treasury Department, and collected from New England coal consumers.

Table of Analyses of New England Coals.

at a temperature of about 218 deg. Fahr. Moisture is always present in varying amounts, and while it has little effect upon the burning of coal, it represents so much water that is being bought at the price of coal, and which requires heat to evaporate it in the furnace. In taking samples of coal by the usual method a great deal of moisture is lost, consequently many analyses of coal from the Northern Appalachian field show only 1 to 1½ per cent., while in reality the coal contains 2 to 4 per cent. moisture. The present indications are that special samples must be taken for the moisture determinations at the time when the coal is weighed, as subsequent rain or drying out will be to the disadvantage of the coal company or the purchaser. Many specifications designate only the dry basis or moisture-free analysis, but this obviously does not represent the coal as weighed and paid



Variation in Constitutents of Coal by Districts.
(Compiled from full-page table.)

for, and often results in the consumer paying a high price for water. Under the same weather conditions some kinds of coal contain a higher percentage of moisture than others, so that if the analyses and heating values on the dry basis are compared for the purpose of selecting the most economical coal, the coal with the lower normal moisture content will be at a disadvantage, and the purchaser may make an unwise choice. For instance, anthracite nearly always contains 2 or 3 per cent. more moisture than does semi-bituminous, so that a comparison of their relative values on a dry basis would unjustly favor the anthracite.

Volatile consists of the combustible gases and some water vapor which is combined with them, and cannot be driven off by mere drying. It is determined by heating a moisture-free sample in a closed platinum crucible for seven minutes over a standard gas flame. This process drives off the volatile or gaseous matter, leaving the fixed carbon and ash. The volatile closely represents the amount of gas that can be made from the coal in retorts, and also the gases that are liberated soon after firing the coal in a boiler furnace. The amount of smoke from a furnace depends upon the amount of volatile in the coal as well as the facilities and method of burning. The volatile is the main constituent considered in classifying coals with respect to their character, such as anthracite 3 to 7.5 per cent. volatile, semi-anthracite 7.5 to 12.5 per cent., semi-bituminous 12.5 to 25 per cent., bituminous 25 to 40 per cent. These are merely arbitrary classifications, as the change is very gradual from one part of the coal field to another. Coal from any one mine or small group of mines, however, is very uniform in the percentage of volatile, and for this reason it is a very useful standard in designating coals and detecting substitutions.

Fixed carbon is determined as the loss in weight resulting from burning the volatile-free sample down to ash. It has been considered by many people as representing the fuel value of a coal, but this is by no means true, as much depends upon the proportions of moisture, ash and volatile in the remainder of the coal, and also upon how rich is the volatile in combustible gases. In reality the fixed carbon is of the least importance in determining the characteristics and quality of a coal.

Ash is the residue left after the fixed carbon has been burned off completely. The ash in coal is non-combustible under any circumstances, and is in reality of greater importance than any other impurity contained in coal; for while the purchaser does not care to pay for water at the rate of $4.00 per ton, he much less cares to pay for ash at this rate and then be charged with the additional expense of removing it from his plant, to say nothing of the trouble caused from the formation of clinkers and from the reduction in the steaming capacity of the boilers. The weight of ashes taken from a boiler plant is not a true indication of the ash contained in the coal, as this weight is increased by unburned coal and coke, the amount of which is affected by the kind of grates and the care exercised by the fireman, and diminished by the amount of ash carried up from the grate by the draft.

Sulphur in coal is determined by burning a portion of the sample intimately mixed with some chemical that will retain all the sulphur of the coal in such a form that it can later be separated as a pure sulphur compound, and weighed. The sulphur itself is of secondary importance as far as steam coal is concerned, and its determination is largely a matter of custom. Sulphur is very injurious in the manufacture of iron and steel, and as the iron manufacturer was the first to analyze coal and coke, the steam coal user has naturally adopted many of his methods and ideas.

The heating value, which is usually expressed in British thermal units per pound, is of very great importance in comparing different kinds of steam coal, as the generation of heat is the primary object. The method of determining the heating value of coal in the laboratory is to burn a portion of the sample in a closed steel bomb which contains an excess of pure oxygen and is surrounded by water. From the weight of coal, and the weight of water used in this determination, together with the increase in temperature of the water and calorimeter, resulting from the combustion of the coal, the total number of heat units developed can be determined with accuracy. It is necessary to use thermometers of great precision, and they should always have been calibrated by some such authority as the U. S. Bureau of Standards. These thermometers should be read to a thousandth part of a degree, and corrections made for the small loss due to radiation, which is always taking place to some extent, no matter what precautions have been taken to reduce it. This process results in determining the total heating value of the coal, and with a constant boiler efficiency the practical results obtained in a power plant are proportional to the B.t.u.

A realization of the need of more definite information concerning the analysis and heating value of the various kinds of steam coal coming to New England has led the committee to collect and compile a large amount of reliable data on this subject. These analyses were collected from tests made by

the U. S. Geological Survey (Technologic branch), the U. S. Treasury Department, and the coal consumers of New England who have been doing this work or having it done. The data obtained by the U. S. Geological Survey have been the result of a special appropriation provided by Congress in 1904 and subsequent years, the work being carried on at the testing plants at St. Louis, later at Norfolk and now at Pittsburg. The analyses made by the Survey from samples of coal as shipped from the mines of Pennsylvania, Maryland, West Virginia and Virginia have been averaged by districts and tabulated in a table. In most cases two or more samples of each car or lot shipped were analyzed, and each analysis has been included in order to reduce the possible error that might occur by using too small a number of analyses. In all, there were 193 samples, representing 55 different lots of coal. The results obtained by the Geological Survey are very reliable, but there were so few samples taken from some of the most important districts that they may not thoroughly represent such districts as a whole.

In addition to the analyses made by the U. S. Geological Survey, 155 others were used from published data, regarding the purchase of coal under Government specifications in the Treasury Department, and some 1,700 commercial analyses.

No analyses of mine samples were used, as these are almost invariably better than the coal as loaded for shipment. The method of taking mine samples is to spread a canvas on the floor of the mine and dig a groove about 3 in. wide and 3 in. deep from the bottom to the top of the seam, discarding any partings of bone, shale, or slate, which are supposed to be kept out by the miner. The miner, however, cannot do as careful work as does the sampler, having many difficulties that prevent him from loading perfectly clean coal. Consequently, coal as shipped is usually from 1 to 2 per cent. higher in ash than mine samples indicate.

Coal Map No.	District	State	Number of Samples	Moisture	Volatile	Fixed Carbon	Ash	Sulphur	British thermal units	
									As rec'd	Dry basis
1	Tioga Co.,	Pa.	6	1.74	19.68	67.09	11.49	1.93	13599	13839
2	Anthracite Buck.	Pa.	148	3.83	4.86	74.54	16.77	0.84	11771	12238
2	" Screengs.	Pa.	57	3.87	5.61	73.26	12.26	0.82	12671	13180
3	Broad Top,	Pa.	84	0.71	15.84	72.95	10.50	1.78	13915	14015
4	Clearfield Co.,	Pa.	185	2.41	20.47	67.50	9.62	2.02	13779	14122
5	Cambria Co.,	Pa.	338	2.53	19.08	70.13	8.26	1.97	14016	14382
6	Somerset Co.,	Pa.	224	2.54	17.51	70.54	9.41	1.13	13873	14237
8	Jefferson Co.,	Pa.	44	1.54	30.35	58.55	9.56	2.22	13661	13875
10	Indiana Co.,	Pa.	45	1.58	22.68	65.08	10.66	2.03	13787	14006
11	Westmoreland Co.,*	Pa.	24	3.25	31.08	55.22	10.45	1.64	13399	13849
14	Pittsburg,	Pa.	16	2.75	33.91	56.28	7.06	1.28	13864	14256
20	Georges Creek,	Md.	199	3.04	18.45	70.07	8.44	1.02	13920	14357
21	Upper Potomac,	Md. & W. Va.	116	2.74	20.07	67.07	10.12	1.06	13659	14045
22	Fairmont,	W. Va.	17	2.48	36.35	53.60	7.57	1.99	13813	14166
23	New River,	W. Va.	395	2.98	20.44	70.26	6.32	0.98	14260	14701
24	Kanawha,	W. Va.	34	3.49	32.39	57.40	6.72	1.12	13809	14309
26	Pocahontas,	W. Va.	118	2.83	17.46	72.64	7.07	0.68	14278	14696
28	Clinch Valley,	Va.	24	4.27	32.30	57.21	6.22	1.04	13755	14369
	Nova Scotia (slack)		5	2.03	27.53	55.57	14.87	1.65	12406	12662
	Rhode Island		1	2.41	4.92	73.61	19.06	0.07	10996	11267

* Eastern Part.

General Average Analysis of New England Coals.

The commercial analyses given in the table represent the average as well as the variation in the results obtained by several New England coal consumers. In compiling these analyses, care and discretion were used in order that only those analyses made from representative samples by proficient chemists should be included. A special representative was engaged to investigate the methods of sampling and analysis and compile the data of the many consumers who are analyzing the coal which they receive. Many instances were encountered where the results were obviously inaccurate and unreliable, and they were consequently not included in the results presented herewith.

The table shows for each district: first, the number of samples taken; second, the average analysis of these samples; third, opposite the words "from" and "to," the range of variation in each constituent.

As a rule there is close agreement between the commercial analyses and those of the U. S. Geological Survey, the widest variation occurring in the moisture and volatile. Some of the commercial samples were taken without due regard for the possible loss in moisture, and they are consequently lower than the true commercial average. The Government analyses are undoubtedly more reliable with respect to moisture. The variation in volatile is largely due to the samples coming from different parts of the field, which, as previously shown, may cause a wide variation.

When referring to the data given in this as well as the other tables it is very important to remember that these values may not accurately represent the average coal coming from the respective districts, but they are given as being the most complete and reliable information that has yet been compiled. The number of analyses that have been averaged from the various districts should be a guide as to the confidence to be placed in them. The same is true of the analyses showing the variation, as there may be better coal than any of that analyzed, and there is very likely still worse coal in the various districts. However, it is believed that these data give a fairly accurate comparison of the relative values of the different kinds of coal available to New England.

One of the most important points brought out by this table is that even though one district may produce coal that is inferior to some other on the average, yet it may contain some coal which is equal or superior to all others.

The general average analysis for each district was compiled from the data in the full page table.

It is to be regretted that much time and money is wasted in obtaining analyses that are misleading, and cause much controversy and dissatisfaction with this method of comparing coals and their fuel values. The most frequent cause of error is in the sampling of the coal for analysis. Coal contains pieces of slate with 100 per cent. ash and no heating value, also very pure pieces of coal, with a low percentage of ash and very high B.t.u., as well as pieces of almost any intermediate quality. There are also lumps as well as fine coal, and sometimes the fine coal is better than the lumps, while in other coal it is just the reverse. Where several hundred, or even thousands, of tons are to be sampled, it is not a simple matter to obtain a truly representative sample. The most frequent cause of error is the taking of too small a sample, as often only a few lumps or a shovelful is taken from the cargo or pile. Even if 100 lbs. be taken, it is quite possible to get a single piece of slate weighing 2 lbs., and this alone represents 2 per cent. of ash. Several hundred pounds should be taken in order that an extra piece of slate or impurity will be a trifling percentage of the total; then, by successively breaking, mixing and dividing the sample, it can be reduced to a few pounds and still retain proportional parts of the various constituents of the original amount. This requires both labor and time, and during the crushing and mixing a great deal of moisture is necessarily lost by evaporation, hence it is necessary to take a separate sample for the moisture determination. Another source of error is in the pulverizing in the laboratory. Before the analysis is made the sample should be fine enough to pass through a 60 or 80-mesh sieve, and in putting it through this sieve some hard particles usually remain that require extra pulverizing. There have been instances where the man doing this work has shirked his duty and thrown this away, leaving only the softer fine coal to be analyzed. In some coal the soft and easily pulverized material is very pure, so that such a sample would be better than the average coal, while in others the reverse is true, owing to the slate being soft and easily disintegrated.

After the sample has been properly taken and prepared, the results obtained in different laboratories should agree, but such does not always appear to be the case. Standard methods have been drawn up and agreed upon by the American Chemical Society, yet many chemists evidently prefer to disregard standards and use special methods of their own. As a rule, any error is likely to be in the direction of lower

results, due to such causes as the blowing out of ash from the crucible, imperfect combustion in the calorimeter, etc. Some companies submitted analyses that were persistently low in ash, as compared with the majority, while others were high in heat units, and others unreasonably erratic in heat units with the same impurities.

There is a wider variation in the B.t.u., or heating value, than in any other of the laboratory determinations. This may be due to the type of calorimeter, accuracy of thermometer, accuracy of standardization, method of manipulation, or the calculation of results from the analysis. Some types of calorimeters give results that are extremely erratic and unreliable, even when manipulated by careful chemists, and care should be taken to secure the best instruments obtainable. Even after the calorimeter has been standardized and the thermometer calibrated, their operation requires skill and care, and should not be entrusted to incompetent persons.

The B.t.u. or heating value of the coal is often calculated from the proximate analysis by means of various formulæ, all based on the assumption that the volatile and the fixed carbon have a certain heating value. These constituents are composed of carbon, hydrogen, sulphur, nitrogen and water in varying amounts, and as the two latter impurities have no heating value, and the B.t.u. of the others vary from 4,000 to 60,000 per pound, none of these formulæ are reliable, and little confidence should be placed in results obtained from their use.

THE PURCHASE OF COAL ON SPECIFICATIONS.

During the past few years a great many coal consumers have taken up the purchase of coal on specifications with varying degrees of success. In this, as in most new movements, some difficulties have been encountered, and the results have not been satisfactory in every case. The principal reasons for failure have been in the application of the method rather than in the method itself. Many misunderstandings have arisen on the one hand because the purchasers are prone to expect too much, to take faulty samples or to act on inaccurate analyses of the coal delivered, and on the other hand because the coal companies are inclined to overestimate the excellence of the coal they are able to deliver.

The general method of buying coal on specifications is for the purchaser to ask for bids, to be based upon the delivery of coal of a specified analysis, allowing certain variations for the B.t.u. and the various constituents. If the analysis shows variations from the specifications, premiums are paid or penalties exacted in proportion to such variations above or below the standard. In some forms of specifications the bidder submits an analysis of coal he proposes to deliver, and the analysis of the successful bidder is taken as a standard for the contract. In some contracts the adjustment of price is based on the moisture, volatile, ash, sulphur and B.t.u., while in others only the ash and B.t.u. are considered.

The B.t.u. should always be one of the factors, as steam coal is purchased for its heating value.

Moisture is also of great importance, as it represents so much valueless material; it should be ascertained when the selling weights are obtained.

Volatile has two objectionable features; first, the production of smoke; second, reduction in boiler efficiency. These may be overcome by proper boiler installation and careful firing with a view to complete combustion. In the absence of these conditions it is best to avoid high volatile coals. It seems that the lower boiler efficiency due to higher volatile coals has been greatly overestimated, for the results of some four hundred boiler tests, made by the U. S. Geological Survey, indicate that the boiler efficiency is about 2 per cent. lower with coal containing 35 per cent. volatile than it is with coal of 15 per cent. volatile.*

Ash affects both the capacity and the efficiency of a boiler, and the price of coal should vary with it. Ash not only replaces combustible material, but also reduces the efficiency of the boiler by clogging the grate, carrying unburned coal with it to the ashpit, and accumulating on the heating surface, thus causing additional labor and extra expense.

Sulphur in excess is penalized because its presence is believed to be a general indication of clinkering properties in coal. This indication is not always correct as fluxing materials other than those accompanying sulphur are usually contained in ash. The average method of analysis does not, however, determine these qualities, nor is it usually worth while to determine them.

There is much diversity of specifications, even for similar coals and similar plants, and there is need for some standardization of their form as well as the method of their application. The American Society for Testing Materials has taken up this matter within the past year, and has appointed a committee of nearly seventy members, consisting of representatives from some of the larger coal consumers, as well as from coal producing and selling companies. This committee expects to outline forms of specification that will cover the various industries besides steam plants who are users of coal, and also cover the methods of sampling and testing. Dr. J. A. Holmes, chairman of this committee, presented a preliminary report at the June, 1909, meeting of this society.

The committee hopes at some future time to furnish information regarding the burning and use of coal.

*Bulletin 325, U. S. Geological Survey.

TRAIN ACCIDENTS IN MAY.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of May, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
2.	E. Paso & S. W.	Santa Rosa.	bc.	Ft. & Ft.	0	2
5.	Balt. & Ohio.	Clarksburg.	bc.	Ft. & Ft.	1	5
14.	St. L. & S. F.	Hugo, Okla.	bc.	Ft. & Ft.	0	6
16.	C., H. & D.	Cincinnati.	bc.	P. & P.	1	7
18.	Terminal R.R.	St. Louis, Mo.	xc.	P. & Ft.	0	6
20.	Bess. & L. E.	Queens Junctn.	rc.	Ft. & Ft.	0	4
24.	A., T. & S. Fe.	Belle Plaine.	bc.	Ft. & Ft.	2	0

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
6.	Pennsylvania	Pittsburgh.	boiler.	Pass.	1	5
12.	Pennsylvania	Kensington, O.	unx.	Pass.	1	7
14.	K. C., M. & O.	Milton, Kan.	d. track.	Pass.	0	20
16.	La. Ry. & N. Co.	Scotland.	malice.	Pass.	2	0
16.	Union Pac.	Cheyenne Wells	wind.	Ft.	0	1
18.	Wabash	DeWitt, Mo.	cow.	Pass.	1	3
21.	M., K. & Tex.	Waxahachie	unx.	Pass.	0	4
23.	Southern	Catlett, Va.	unx.	Pass.	0	17
23.	Balt. & Ohio.	Columbus, O.	unx.	Pass.	0	4
23.	St. L. & S. F.	Rogers.	unx.	Pass.	3	32
24.	Norf. So.	Hertford.	unx.	Pass.	0	21
25.	Den. & Rio G.	Cucharos Jc.	d. track.	Pass.	0	14
†29.	Lehigh Valley	Stull.	unx.	Pass.	2	30
30.	Southern	Sycamore.	unx.	Pass.	0	12
30.	Mobile & O.	Scooba.	ms.	Ft	2	1
31.	Union Pacific.	Ogallala.	b. rail.	Pass.	0	3

None of the accidents in the foregoing list can be called notable or particularly unusual. The butting collision at Cincinnati, on the sixteenth, occurred on a double-track road. One of the tracks was temporarily assigned to emergency use for the trains of another company and in the meantime the other one was operated as single track by the use of telephones. The operator at one end of the section, having control of the line, gave to the other operator authority for a clear signal when the track was not clear. The derailment at

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Kensington, Ohio, on the twelfth, is said to have occurred a moment after a severe application of the brakes, and the accounts seem to indicate that this was what caused the engine to run off the track. In the derailment of a passenger train at Dewitt, Mo., on the eighteenth, the private car of the superintendent of the road was overturned and fell down a bank, but its occupants were not seriously injured. The engineman was fatally scalded. At Cheyenne Wells on the sixteenth nine cars of a freight train were blown off the track by a high wind. The derailment at Stull, Pa., on the twenty-eighth, occurred at a switch leading to a side track remote from any station, and one of the cars was broken in two and fell down a bank. Two passengers in this car were killed. One of the accounts says that this switch had been tampered with, but the evidence to this effect does not appear to be conclusive.

One of the accidents which does not appear in our record, but which was of a kind that may occur more frequently in the future than in the past, is described in a press despatch from Edwardsville, Ill., as follows: "Five officers of the Louisville & Nashville Railroad were injured to-day [May 23] when the gasoline motor in which they were speeding towards Edwardsville was derailed by a dog near the Cahokia creek crossing."

The most prominent railway accident in May occurred on an electric line and so does not appear in our table. It occurred on the Illinois Traction lines at Lovelace, Ill., seven miles south of Carlinville, at 3 o'clock on the morning of the twentieth. It was a butting collision between a northbound train consisting of a single sleeping car, and a southbound train consisting of a motor car drawing two freight cars loaded with whiskey. This southbound train ran past the side track where it should have met the northbound. The wreck was set afire by the short-circuiting of the electric current and was burned so quickly that the five passengers in the sleeping car had barely time to escape. The conductor and motorman of the southbound train were probably killed instantly. Their bodies were burned up. The line of road at this point is straight, or nearly straight, and the fact that the southbound train ran past the side track was seen by the motorman of the northbound, and he had brought his car nearly to a stop.

Eight other accidents were reported on electric lines in the month of May, three of them being attended with fatal results. In one case, near Springfield, Ohio, a freight car broke away from the rear of a train ascending a grade and ran back into a passenger car. In a butting collision near Oakland, Cal., two passengers were killed and 50 were injured.

STANDARD SPECIFICATIONS FOR CONCRETE REINFORCEMENT BARS.

Adopted, 1910, by The Association of American Steel Manufacturers, Pittsburgh, Pa.

MANUFACTURE.

1. Steel may be made by either the open-hearth or Bessemer process. Bars shall be rolled from billets.

CHEMICAL AND PHYSICAL PROPERTIES.

2. The chemical and physical properties shall conform to the limits given in the accompanying table.

CHEMICAL DETERMINATIONS.

3. In order to determine if the material conforms to the chemical limitations prescribed in paragraph 2 herein, analysis shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt or blow of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector.

YIELD POINT.

4. For the purposes of these specifications, the yield point shall be determined by careful observation of the drop of the beam of the testing machine, or by other equally accurate method.

FORM OF SPECIMENS.

5. (a) Tensile and bending test specimens may be cut from the bars as rolled, but tensile and bending test specimens of deformed bars may be planned or turned for a length of at least 9 in. if deemed necessary by the manufacturer in order to obtain uniform cross-section.

(b) Tensile and bending test specimens of cold-twisted bars shall be cut from the bars after twisting, and shall be tested in full size without further treatment, unless otherwise specified as in (c), in which case the conditions therein stipulated shall govern.

(c) If it is desired that the testing and acceptance for cold-twisted bars be made upon the hot rolled bars before being twisted, the hot rolled bars shall meet the requirements of the structural steel grade for plain bars shown in this specification.

NUMBER OF TESTS.

6. At least one tensile and one bending test shall be made from each melt of open-hearth steel rolled, and from each blow or lot of ten tons of Bessemer steel rolled. In case bars differing $\frac{3}{8}$ in. and more in diameter or thickness are rolled from one melt or blow, a test shall be made from the thickest and thinnest material rolled. Should either of these test specimens develop flaws, or should the tensile test specimen break outside of the middle third of its gaged length, it may be discarded and another test specimen substituted therefor. In case a tensile test specimen does not meet the specifications, an additional test may be made.

(d) The bending test may be made by pressure or by light blows.

MODIFICATIONS IN ELONGATION FOR THICK MATERIAL.

7. For bars less than $\frac{7}{16}$ in. and more than $\frac{3}{4}$ in. nominal diameter or thickness, the following modifications shall be made in the requirements for elongation:

(e) For each increase of $\frac{1}{8}$ in. in diameter or thickness above $\frac{3}{4}$ in. a deduction of 1 shall be made from the specified percentage of elongation.

(f) For each decrease of $\frac{1}{16}$ in. in diameter or thickness below $\frac{7}{16}$ in. a deduction of 1 shall be made from the specified percentage of elongation.

(g) The above modifications in elongation shall not apply to cold-twisted bars.

NUMBER OF TWISTS.

8. Cold-twisted bars shall be twisted cold with one complete twist in a length equal to not more than 12 times the thickness of the bar.

FINISH.

9. Material must be free from injurious seams, flaws or cracks, and have a workmanlike finish.

VARIATION IN WEIGHT.

10. Bars for reinforcement are subject to rejection if the actual weight of any lot varies more than 5 per cent. over or under the theoretical weight of that lot.

	Structural steel grade.		Hard grade.		Cold-twisted bars.
	Plain bars.	Deformed bars.	Plain bars.	Deformed bars.	
Phosphorus, maximum: Bessemer	.10	.10	.10	.10	.10
Open-hearth	.06	.06	.06	.06	.06
Ultimate tensile strength, lbs. per sq. in.	55,000 to 70,000	55,000 to 70,000	80,000 min.	80,000 min.	Recorded only
Yield point, minimum, lbs. per sq. in.	33,000	33,000	50,000	50,000	55,000
Elongation, per cent., in 8-in. minimum	1,400,000 / T. S.*	1,250,000 / T. S.*	1,200,000 / T. S.*	1,000,000 / T. S.*	5 per cent.
Cold bend without fracture:					
Bars under $\frac{3}{4}$-in. in diameter or thickness	180° d. = 1t.	180° d. = 1t.	180° d. = 3t.	180° d. = 4t.	180° d. = 2t.
Bars $\frac{3}{4}$-in. in diameter or thickness and over	180° d. = 1t.	180° d. = 2t.	90° d. = 3t.	90° d. = 4t.	180° d. = 3t.

*Tensile strength. NOTE.—The high-grade will be used only when specified.

General News Section.

The Lehigh Valley is to put portable telephones on its passenger trains, with "fish poles" to connect with the line wires at any point on the road.

The Chicago & Alton and the Missouri, Kansas & Texas, now both "Hawley roads," are running sleeping cars through between Chicago and Galveston.

Edward A. Moseley, secretary of the Interstate Commerce Commission, has received from Notre Dame University, Notre Dame, Ind., the honorary degree of Doctor of Laws.

General Manager Dice, of the Philadelphia & Reading, has agreed with representatives of the conductors and trainmen to increase their wages from 6 per cent. to 20 per cent.

Justice William H. Moody, of the supreme court of the United States, is to retire before the end of the present year, continued ill health making it impossible for him to attend to his duties.

At Harrisburg, Pa., E. M. Rader, 22 years old, has been sentenced to two and a half years' imprisonment for stealing wires from automatic block signals and thereby stopping trains.

In the federal court at Chicago this week the Illinois Central was indicted by the grand jury for violation of a public tariff, and the Pennsylvania Company was indicted for destroying waybills of shipments of freight consigned to the Illinois Steel Co.

The Great Northern and the Pullman companies have asked the Interstate Commerce Commission for a rehearing of the case in which their rates for berths were ordered reduced. The Great Northern desires to present detailed statements of the receipts and expenses of sleeping car lines.

The Boston & Maine has increased the pay of its clerks who are members of the Brotherhood of Railway Clerks, granting, according to newspaper reports, the sum of $72,000 to be distributed among the clerks according to the wishes of the committee of the brotherhood. It is said that the average increase will be about 25 cents a day.

President Ripley, of the Atchison, Topeka & Santa Fe, said last week that his company would suspend work on all improvements and extensions so far as this could be done without causing a greater loss than would be incurred by keeping on. President Willard, of the Baltimore & Ohio, says that his road has not countermanded any orders for improvements.

Reports from the City of Mexico say that the National Railways of Mexico—that is, the Government of the republic—will soon acquire the Pan-American, which recently came under the control of D. E. Thompson. The *Mexican Herald* says that the Tehuantepec National and other roads will soon be acquired, so as to make a complete governmental system, leaving out only the Mexican Railway and the lines controlled by the Southern Pacific.

The Pennsylvania has in service on its lines, or on order, nearly 2,000 passenger cars of all-steel construction. These cars have been added to the company's passenger equipment since June, 1906, when it was announced that all future additions to passenger equipment would be of all-steel construction. The lines on which steel cars will be operated, include the lines east and west of Pittsburgh and Erie, the Long Island, the Cumberland Valley, the New York, Philadelphia & Norfolk, the Vandalia and the Grand Rapids & Indiana.

At Knox, Albany county, N. Y., recently, 31 trespassers were arrested in a bunch for stealing coal from cars of the Delaware & Hudson. It is said that these trespassers, who are foreigners employed in a stone quarry, had become so bold that they would display signals to stop coal trains and would be on hand in such large numbers that before the train could be again started they would pull several tons of coal off the cars. Of the 31 persons arrested 13 were fined $10 each, 12 were held for the grand jury and six others were allowed to go on suspended sentences.

All the through passenger trains of the Burlington are now electric lighted throughout, from locomotive to observation platform. Seventy-two complete trains and practically all the reserve passenger equipment of the entire Burlington system have been equipped, including locomotives, baggage cars, mail cars, coaches, chair cars, dining cars, sleeping cars and observation cars. No such extensive and costly improvement of coach lighting has been attempted before. These electric-lighted trains run between Chicago, St. Louis, St. Paul, Omaha, Kansas City, Denver, Billings, Spokane, Seattle, Tacoma and Portland. The dynamo system is used, a dynamo in the baggage car of each train. An electrician is on duty on each train for its entire run.

The Canadian Pacific has agreed with its telegraphers to make an increase of pay which, it is said, will average $5 a month for each operator.

Officers of the Pennsylvania, following protracted negotiations, have sent to the committees of their Brotherhood employees revised schedules of wages, but neither the road nor the employees will give any information as to the amounts of the proposed or desired increases.

Messrs. Knapp and Neill, government mediators, were called in last week to consider disputes between a number of railways of the southeastern states and their conductors and trainmen. These employees have been demanding large increases in pay, and it is said, have lately threatened a strike unless the companies acted promptly. The mediators have also been asked to take up questions concerning wages between the Gulf & Ship Island and its telegraphers.

Railway Matters in Washington.

Washington, June 22, 1910.

The administration railway bill was passed in short order. The conference report was adopted in the Senate last Friday evening without modification, after a discussion of about six hours. The discussion brought out nothing new. The vote on adoption was 50 to 11. Senator Newlands, of the conference committee, who represented a minority report, simply complained that the majority of the conference committee held conferences and agreed on their final course before allowing the minority to have anything to say. The House discussed the bill for about six hours on Saturday, but the representatives, like the senators, simply thrashed over old straw and adopted the bill as it stood. The final vote consisted of such a longdrawn out volume of "ayes" that the very few Democrats who voted against it were scarcely heard. Representative Adamson, of Georgia, the senior minority member of the house committee on interstate commerce, protested against the passage of the law on the ground that it still contained "the initiation of a pernicious system of stock and bond regulation and the creation of a commerce court, a useless and foolish travesty on jurisprudence and an unconstitutional mutilation of our judicial system. The bill still gives to the attorney general, though in a modified form and degree, control of litigation." [A precis of the law will be found in another column.] The following sections which had been passed by one house or the other were left out: (1) That permitting traffic agreements; (2) that permitting one railway to purchase stock of another already controlled; (3) to make physical valuation of railways; (4) authorizing federal regulation of stock and bond issues.

It is announced that President Taft will not appoint the judges for the commerce court until next December. He holds that a federal judge should not sit on the bench until his appointment has been confirmed by the Senate.

Among the appropriations made by the present Congress are one of $200,000 to the Department of Justice for the prosecution of violations of the anti-trust law, and one of $30,000 to enable the Department of Agriculture to see if a substitute can be found for spruce timber for the manufacture of paper.

Congress has passed a bill authorizing an issue of bonds

to the extent of $20,000,000 to facilitate prompt completion of irrigation projects already undertaken.

The proposed law to regulate the issuance of bills of lading is said to have no prospect of passage at the present session of Congress, but the committee has continued to hold hearings and the railways have presented their objections. Roberts Walker told the committee that the bankers and cotton shippers were trying to use railway capital to guarantee bills of lading for their own benefit. He presented figures showing that on the Rock Island only 20 in a hundred of the bills of lading issued were made out to shipper's order, and of these 20 only 3 per cent. are used as a basis of credit. G. W. Neville, of the New York Cotton Exchange, arguing in favor of the bill, said that the sum of $8,000,000 was lost by consignors through fraudulent bills of lading in one year.

Railways Still Breathing.

The railways of this country are not going into bankruptcy; they are not in any general sense going to reduce their dividends even if, as it now appears entirely improbable, the Interstate Commerce Commission should refuse to permit a considerable advance in freight rates. It is highly important to bear in mind that future expansion deals primarily with local traffic, so far as the freight business is concerned. This traffic is not concerned with interstate rates and is a traffic that must, as a result of the development of the country, increase by leaps and bounds from year to year. The great highways of commerce have rights of way which are becoming increasingly valuable, and the railway problem, in a word, has a particularly bright side that seems entirely overlooked in the spread of the current wave of pessimism.—*Journal of Commerce.*

New Engineering Laboratories at Lehigh University.

On June 11 last the new Fritz engineering laboratory and the Eckley B. Cox mining laboratory were formally opened. The following description of these new buildings in taken from the Lehigh University Register, 1910:

Fritz Engineering Laboratory.—John Fritz, a member of the Board of Trustees of Lehigh University ever since its foundation, has recently donated the funds for the erection and thorough equipment of an engineering laboratory. The building was designed by Mr. Fritz and erected under his personal supervision. It is equipped with a general testing section for testing iron and steel, a cement and concrete section and a hydraulic section. The equipment will be used by the civil engineering department as an aid to the instruction of those students in any department who take the courses in strength of materials, hydraulics, and cement.

The building is of steel frame construction, 94 ft. wide and 115 ft. long, with the main central section 65 ft. high and two side sections of lesser height. The exterior walls which enclose the steel frame are of cement, brick lined on the inside. A 10-ton electric traveling crane serves the central portion of the building. The general testing section is equipped with an 800,000-lb. Riehlé vertical screw testing machine, capable of testing columns up to 25 ft. long, tensile specimens up to 20 ft. long and transverse specimens up to lengths of 30 ft.; an Olsen universal testing machine of 300,000-lb. capacity; smaller machines for ordinary tension, compression, transverse and torsion tests; a complete road materials testing equipment, and a small machine shop. The hydraulic section occupies the easterly end of the main room and is equipped with various tanks, weirs, pumps and other hydraulic apparatus. The cement and concrete section has one large room for making and testing specimens and one room for storage of materials.

Eckley B. Cox Mining Laboratory.—This building is of dressed sandstone. It is 100 ft. long by 75 ft. deep, one story high in front, with a raised floor in the rear. The main part of the building contains the ore-dressing laboratory, 40 ft. x 70 ft.; the western wing contains a chemical laboratory, an assaying room and a shop, and the east wing contains the office and a recitation room.

The equipment, made by the Allis-Chalmers Co., Milwaukee, Wis., consists of gyratory crusher, rolls, screens, jigs, Huntington mill, classifiers, concentrators (table and ranner), gravity stamps, copper plates, grinding pan and cyanide plant, with the necessary apparatus. This machinery will be driven by five separate motors and any one part or all of it can be operated at will, thus enabling experimental studies and tests to be made of individual machines or groups of machines, or of an entire process.

Receiver Appointed for Blue Island Car Company.

Charges of fraud are made in a petition for a receiver filed to-day by the Illinois Central aaginst the Blue Island Car & Equipment Co. Judge Windes appointed the Chicago Title & Trust Co. receiver.

Other defendants named in the petition are J. E. Buker, William Renshaw, O. S. Keith and J. M. Taylor, all formerly employed by the Illinois Central, and H. C. Ostermann, and F. H. Niles.

The petition charges that the Blue Island Car & Equipment Co. has no assets other than those out of which the Illinois Central has been defrauded. It is charged that Messrs. Ostermann and Niles conspired with Mr. Buker and the others named to form a corporation, the car and equipment concern, to defraud the railway. Later the business was turned over to a company known as F. H. Niles & Co., the latter later changing its name to the Blue Island Rolling Mill & Car Company. The bill charges that the Blue Island Rolling Mill & Car Company owes the Illinois Central $600,000 and is without adequate assets.

Motor Versus Mules in Virginia Mountains.

A lot of coal, weighing 18 tons, was recently carried from the tracks of the Southern Railway at Culpeper, Va., to Sperryville, twenty miles, on a three-ton motor truck in two and a half days, six trips being made. In the past it has taken a good six-mule team two weeks to accomplish the same work. The road is a good, hard one, but it leads into a mountainous country and has many long and heavy grades. The experiment was made by the C. C. Smoot Sons Company, which runs a tannery at Sperryville. So satisfactory were the results that the company has bought a truck and will hereafter use it in carrying coal and hides to the tannery and taking its products to the market.

Disastrous Collision at Villepreux, France.

In a rear collision of passenger trains at Villepreux, France, on Saturday last 19 persons were killed and 30 injured. A local train standing at the station was run into at the rear by a following express train. The wreck took fire and one of the trains was entirely consumed.

Demurrage Managers' Convention.

The 21st annual meeting of the American Association of Car Demurrage Officers was held at Omaha, Neb., June 17, President M. C. Shields in the chair. A majority of the 35 car demurrage bureaus or associations of the country were represented. The president made no formal address. After roll call the secretary presented his usual address, confining his remarks mainly to a recital of the principal events in the demurrage world which have occurred since the last annual meeting, namely, the adoption of the National Code of Car Demurrage rules by the National Association of Railway Commissioners, approved by the Interstate Commerce Commission and adopted and recommended by the American Railway Association and adopted by most of the car demurrage bureaus of the country.

J. F. Roach, manager of the Central Car Demurrage Bureau, St. Louis, read a paper entitled "The Industrial Line," in which he advocated the importance of some time allowance to be given to the minor railways for switching. It was the consensus of opinion of the members present that some arrangement for this could be agreed upon between the carriers and the minor roads.

The most of the time was devoted to the interchange of views concerning the practices of the different managers in

relation to the application and construction of the uniform demurrage rules and explanations recommended by the American Railway Association.

J. F. Roach, of St. Louis, Mo., was elected president for the ensuing year, and I. R. Tuyl, manager of the Western Car Demurrage Bureau, Omaha, vice-president. A. G. Tromason, Scranton, Pa., was re-elected secretary and treasurer. Niagara Falls, N. Y., was selected as the place for the next annual meeting, which is to be held June 20, 1911.

American Street and Interurban Railway Manufacturers' Association.

Convention Circular No. 2 announces that for the 29th annual convention to be held at Atlantic City, N. J., October 10-14, 1910, the Manufacturers' Association has again secured the use of Young's Million Dollar pier for exhibit purposes. Alterations have been made to the pier, and for the coming convention there will be available upwards of 70,000 sq. ft. of exhibit space, arranged so as to present an excellent layout, with all spaces practically of equal importance as far as location is concerned. The executive committee has fixed the rate for this year at 30 cents per sq. ft., which price includes light, electric power, etc., with booths complete ready to receive exhibits. The exhibit committee is preparing a diagram showing the arrangement of the exhibit space, copy of which will be forwarded to each member, together with full detailed information concerning the exhibits; also an application blank for space. A circular containing information regarding hotel rates is also being prepared and will be issued within a short time.

The Street Railway Association has increased its membership to over 350 member companies, included among which are some of the most prominent steam roads that are electrifying parts of their systems. This increased membership will naturally result in a great increase in the number of railway officers attending the convention.

Roadmasters and Maintenance of Way Association.

The twenty-eighth annual convention will be held at Chicago, September 13-16, 1910. Following are the subjects to be discussed and the commitees of each:

"Proper Care of Track Material and Tools."—A. Hensen, chairman, C. & N. W., Green Bay, Wis.; J. W. McManama, B. & M., Waltham, Mass.; James Sweeney, C. & E. I., Danville, Ill.; M. Lumm, Wabash, Montpelier, Ohio; C. H. Cornell, C. & N. W., Antigo, Wis.

"Cattle Guards."—C. J. Muschott, chairman, Benton Harbor, Mich.; M. McFadden, C. & N. W., Marinette, Wis.; James Ryan, Jr., C. & E. I., Villa Grove, Ill.; M. H. Connolly, C. N., Van Wert, Ohio; B. F. Brown, B. & M., Lydonville, Vt.; Charles Newberg, C. & N. W., Eagle Grove, Iowa.

"New and Improved Appliances Including Ties."—L. Lawler, chairman, Southern Pacific, Lafayette, Ind.; L. C. Ryan, C. & N. W., Baraboo, Wis.; E. P. Safford, L. S. & M. S., Adrian, Mich.; B. A. West, A., T. & S. F., Pueblo, Colo.; John Nugent, C., R. I. & P., Iowa City, Iowa; John Mulvoy, M. & O., Meridian, Miss.

"Standard Switch Targets."—J. M. Meade, chairman, A., T. & S. F., Topeka, Kan.; M. Hermans, C. & N. W., Green Bay, Wis.; W. H. Putcamp, U. P., Omaha, Neb.; J. G. Hutchison, C., R. I. & P., Herrington, Kan.; F. D. Harrigan, P. M., Saginaw, Mich.; A. Clough, N. Y. C. & H. R., Batavia, N. Y.

"Rail Fastenings Including Insulated Joints."—Thomas Thompson, chairman, A., T. & S. F., Joliet, Ill.; W. A. Brandt, C. & N. W., Clintonville, Wis.; John Heshion, Mo. Pac., Concordia, Kan.; Tilman Burket, Penn. R.R., Bedford, Pa.; M. Foley, B. & O., Myersdale, Pa.; C. F. Boone, B. & A., Houlton, Me.

"Tie Plates and Rail Anchors."—L. C. Ryan, chairman, C. & N. W., Baraboo, Wis.; F. E. Sampson, B. & M., Concord, N. H.; J. O'Leary, C. & A., Joliet, Ill.; P. J. McAndrews, C. & N. W., Belle Plaine, Iowa; Warren Peachy, E. & T. H., Evansville, Ind.; John Boland, U. P., Lawrence, Kan.

Paper on "Treated Timber," by J. L. Single, Newark, N. J.

Paper on subject to be selected by himself by W. M. Camp, Chicago.

Topical questions for discussion: "Dressing of Gravel Ballasted Track," "Paving of Ditches," "Length and Size of Ties," "How to Drain the Midway of Double Track Whether by Surface Ditches or by Tile Drains," "Should the gage on curves be Readjusted to the side of the Rail Head and by Moving which Rail," "Quality of Track Labor."

Committee of Arrangements: W. E. Emery, chairman, Peoria, Ill.; A. E. Hansen, C. & N., Green Bay, Wis.; W. M. Camp, *Railway and Engineering Review*, Chicago.

Baggage Agents.

The American Association of General Baggage Agents held its annual meeting in Detroit last week. The president for the ensuing year is W. M. Skinner, of the New York Central; secretary (re-elected), J. E. Quick, Grand Trunk, Toronto. The meeting next year will be held at San Antonio, Tex., February 15.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.;
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago.
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues.; New York.
American Street and Interurban Railway Ass'n.—H. C. Donecker, 29 W. 39th St., New York; Oct. 10-14; Atlantic City.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., New York.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.
General Superintendents' Assoc. of Chicago.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit, Mich.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass., 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wed.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
Canada.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.
Richmond Railroad Club.—F. O. Robinson; 2d Monday; Richmond.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; annual, Sept. 13-16; Chicago.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Ry. Financial Officers.—C. Nyquist, La Salle St. Sta., Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Train Despatchers' Assoc. of America.—J. F. Mackie, 7042 Stewart Ave., Chicago.
Transportation Club of Toledo.—L. G. Macomber, Woolsen Spice Co., Toledo.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The trunk lines have notified the New York State Public Service Commission that certain increases of rates, which had been announced to go into effect in July, have been postponed because of the postponement of increases in certain interstate rates by reason of action at Washington.

The Colonial Navigation Co., advertising itself as the only independent line between New York and New England, is now running the screw steamers, "Concord" and "Lexington," between New York and Providence; fare between New York and Boston, $2.65; New York and Providence, $1.75.

The Legislature of New York has appropriated $600,000 to be used under the authority of the Public Service Commission for the abolition of grade crossings. Under the New York law improvements of this kind are usually paid for by the railway, the town and the state jointly, the state paying one-fourth of the total cost.

The railways hauling coal to Chicago have sent to the Illinois State Railroad Committee a defense of their proposed increase of ten cents a ton in the rates from Indiana and Illinois mines. They show that the rates on coal are 40 per cent. less than those on other freight, and that in many cases the revenue is barely equal to the cost, and in some cases perhaps less than the cost.

An officer of the Southern Railway says that manufacturers situated on that company's line in Virginia now produce 300 barrels of agricultural lime daily, and soon will be able to furnish 5,000 barrels daily. Extensive areas of land in the southern states have been greatly improved by the use of lime, in addition to ordinary fertilizers, and the industrial department of the road is endeavoring to disseminate information as to the value of lime on lands lacking nitrogen.

E. B. Thomas, president of the Lehigh Valley, has issued a statement explaining the refunding of demurrage charges by his road to the Bethlehem Steel Company, which has been declared illegal by the federal court in a suit tried at Philadelphia. Mr. Thomas says that the bills in question extended over a period of five years, and that after long negotiations the road had agreed to the steel company's view that certain charges had been erroneously assessed. The Bethlehem Steel Co. had complained that the rules applying at Bethlehem were less favorable than those at other steel works, and the road, finding this contention correct, changed the rules. The action of the road was approved by the demurrage bureau and by its own legal department.

The State Railroad Commission of Indiana now issues tariff bulletins monthly. The form is somewhat similar to that issued weekly by the Public Service Commission of the Second district of New York, but in the last Indiana issue seven pages are filled with advances in rates on coal, C. L., arranged in tabular form, somewhat as in ordinary tariffs. Many or most of the coal carriers of the state have advanced their rates but not all the changes are shown in these tables. A lot of 70-cent rates are advanced to 80 cents per net ton; a lot of rates for shorter distances are advanced five cents a ton, and a large group of rates which were $1.20 are advanced to $1.28. From the Linton district, on the Southern Indiana, to certain points on the Big Four the rate per net ton is raised from $1.05 to $1.33, an increase of 28 cents, which is the largest increase that we notice. These increases on coal were originally filed as to take effect July 1, but, by permission of the commission, they have now been changed and they will take effect July 25.

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 74, covering car balance and performance for February, 1910, says:

"February reports show a marked improvement over the two

CAR BALANCES AND PERFORMANCES IN FEBRUARY, 1910.

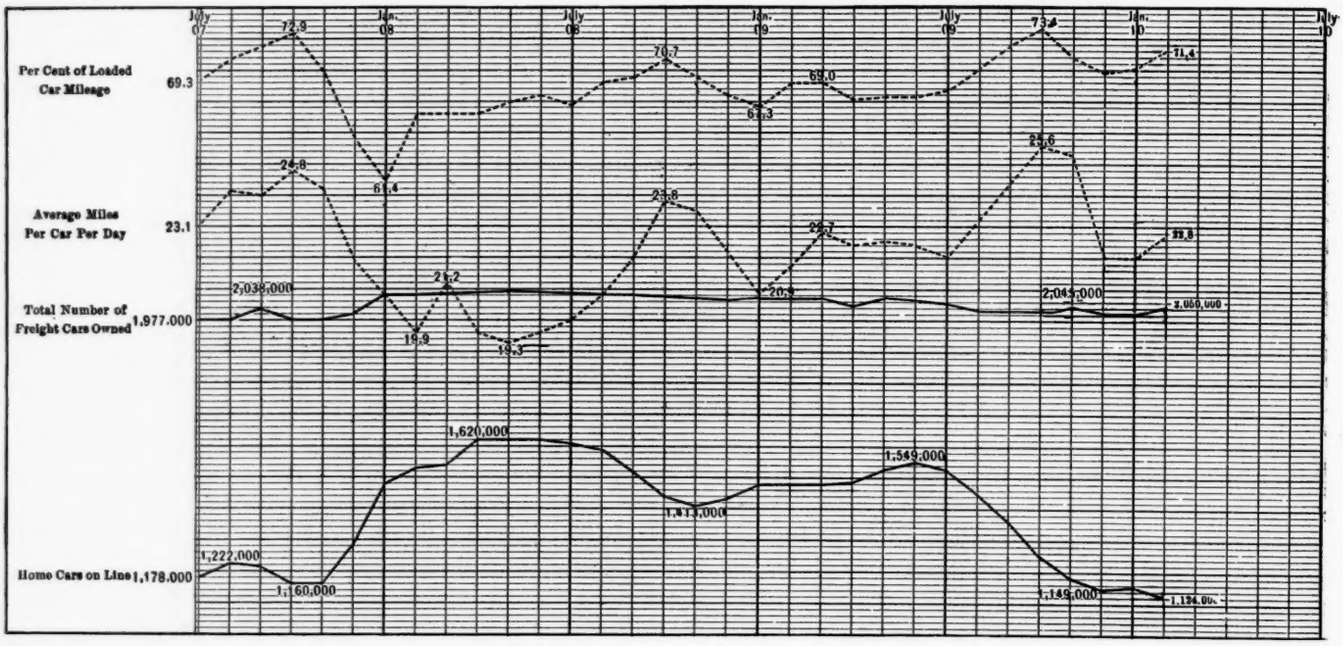
	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo, Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	76,432	676,047	213,716	169,781	175,228	340,515	17,074	134,877	28,415	117,730	101,029	2,050,844
Average number of system cars on line	39,707	356,446	107,825	95,149	83,980	220,920	5,978	74,669	18,584	57,048	63,634	1,123,940
Railroad-owned cars: Av. foreign on line	40,208	286,126	93,036	62,031	70,328	183,018	15,646	60,235	19,591	56,980	24,487	911,686
Total cars on line	79,915	642,572	200,861	157,180	154,308	403,938	21,624	134,904	38,175	114,028	88,121	2,035,626
Excess	2,483	.....	.....	.....	.....	63,423	4,550	17	9,760	.....	.....	.....
Per cent. cars on line to total owned:												
Home	52	53	50	56	48	65	34	55	65	48	63	55
Foreign	53	42	44	36	40	54	92	45	69	48	24	44
All railroads	105	95	94	92	88	119	126	100	134	96	87	99
Private cars on line	3,339	40,450	10,934	3,522	6,862	17,085	1,454	6,583	2,351	8,629	2,981	104,190
Total, all cars on line	83,254	683,022	211,795	160,702	161,170	421,023	23,078	141,487	40,526	122,657	91,102	2,139,816
Per cent. of cars in shop	3.80	5.15	5.61	5.56	7.25	3.99	3.98	3.70	4.98	4.79	5.49	5.37
No. of freight engines owned	1,130	10,100	2,780	2,992	2,589	5,463	462	2,575	815	2,337	2,484	33,727
Av. cars on line per freight engine owned	74	68	76	54	62	77	50	55	50	52	37	63
Total freight-car mileage	37,840,035	451,399,817	128,977,181	113,787,943	107,771,923	216,499,560	21,154,134	82,547,071	29,304,603	101,988,020	70,561,950	1,361,832,257
Average miles per car per day	16.2	23.6	21.7	25.3	23.9	18.5	32.7	21.8	25.8	29.8	27.7	22.8
Per cent. loaded mileage	75.2	68.1	73.4	68.7	74.1	73.9	77.4	71.1	68.8	70.8	80.8	71.4
Ton-miles of freight, inc. Co. freight	434,776,151	7,515,979,024	2,035,358,161	1,779,101,833	1,636,038,324	2,888,139,652	363,653,037	1,273,358,771	363,827,382	1,566,179,499	1,067,296,654	20,922,864,484
Average ton-miles, including Co. freight:												
Per car-mile	11.5	16.6	16.8	15.6	15.3	18.1	17.9	15.4	12.4	15.6	15.1	16.2
Per loaded car-mile	15.3	24.5	22.9	22.8	19.3	24.6	25.1	22.1	18.0	22.0	18.7	22.7
Per car per day	186	393	367	395	365	351	624	336	321	460	418	376
Gross freight earnings	$4,950,066	$42,875,190	$11,775,731	$10,786,211	$10,801,799	$22,300,296	$2,758,304	$6,535,414	$3,082,799	$12,929,101	$6,696,109	$135,491,020
Average daily earnings: Per car owned	$2.31	$2.27	$1.97	$2.27	$2.20	$2.34	$5.77	$2.18	$3.87	$3.93	$2.41	$2.39
Per railroad-owned car on line	2.21	2.38	2.09	2.45	2.50	1.97	4.56	2.19	2.88	4.08	2.75	2.41
All cars on line	2.12	2.24	1.98	2.40	2.39	1.89	4.27	2.08	2.72	3.80	2.66	2.30

preceding months in all the performance items. The car balance figures denote considerable activity in freight car interchange during the month, the cars on home lines having decreased to 55 per cent., but one point higher than the average for April, 1907, which was the lowest of which there is any record.

"There was a decrease in the shop percentage, which averaged 5.37 per cent., the lowest figure since November, 1907.

"The miles per car per day averaged 22.8. The tons per loaded car made a new record mark of 22.7, which in connection with a loaded car mileage of 71.4 per cent. produced an average of 16.2 tons per car-mile, loaded and empty. The ton-miles per car per day averaged 376, the average exclusive of idle cars being 9 points higher. The average daily earnings were $2.30 per car, an increase of 11 cents over the January figure."

The accompanying charts show the important averages of car balance and performance from July, 1907, to date. We give that part of the bulletin table which shows the totals and averages for the groups.

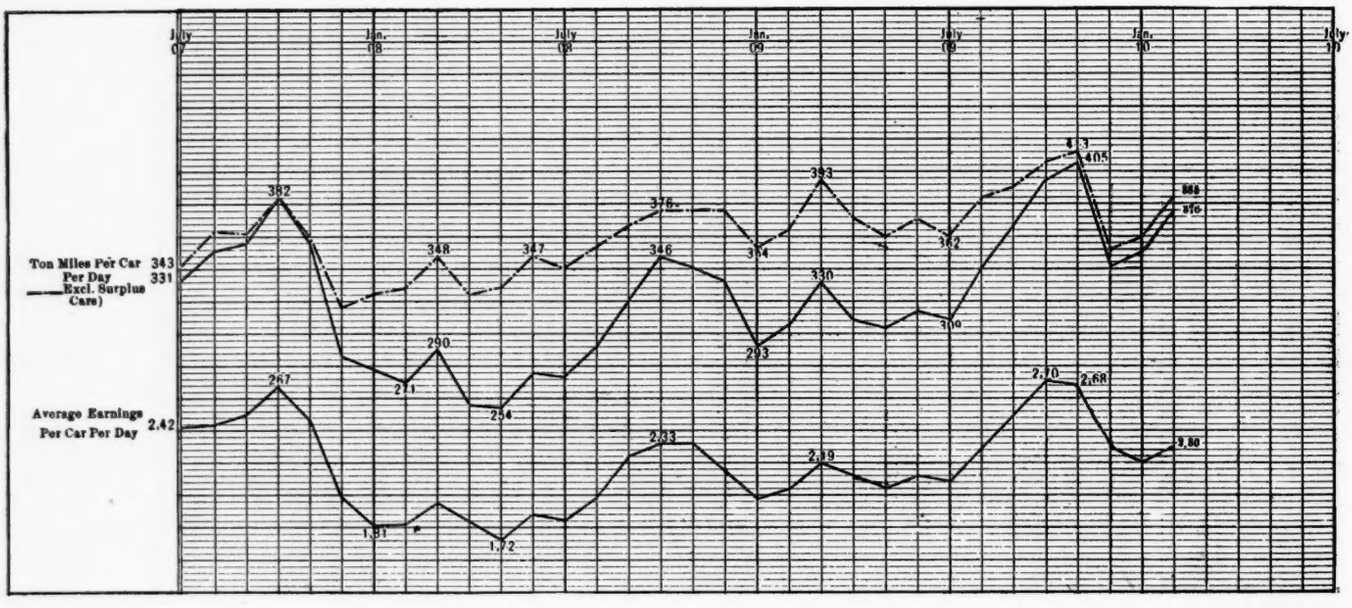


Car Balance and Performance.

Foreign Bankers and Bills of Lading.

The efforts of a committee of bankers to secure a federal law regulating bills of lading have been noticed in a previous issue. Lewis E. Pierson, speaking for the bankers, says that the recent swindles in bills of lading have so shaken the confidence of bankers in England and Germany that there is danger of serious difficulty in moving the crops the coming fall. He believes that in the case of the Albany failure the railway agent signed bills of lading in blank before receipt of the goods. In shipments to this same firm the agents surrendered the grain without taking up the bills of lading, the dates of which were then altered and the instruments used as collateral for loans. Continuing, he says:

"In the case of the two southern failures it is claimed that the bills of lading involved were forgeries, but the evidence shows that it was the custom of the railroads where the firms were located to allow several different employees to sign the same agent's name to the instruments. It has been definitely ascertained that some of these so-called 'forged' bills were



Car Loading and Earnings.

issued for goods the agents never received. In other cases two or three bills appear outstanding against the same shipment. Occurrences of this sort are so general as to lead to the belief that in many cases these practices have taken the place of rebates as a means of retaining the business of favored shippers. A good part of the $10,000,000 losses sustained in these three recent failures will fall on foreign bankers who had accepted drafts accompanied by worthless bills of lading."

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 73, giving a summary of shortages and surpluses by groups from January 20, 1909, to June 8, 1910, says:

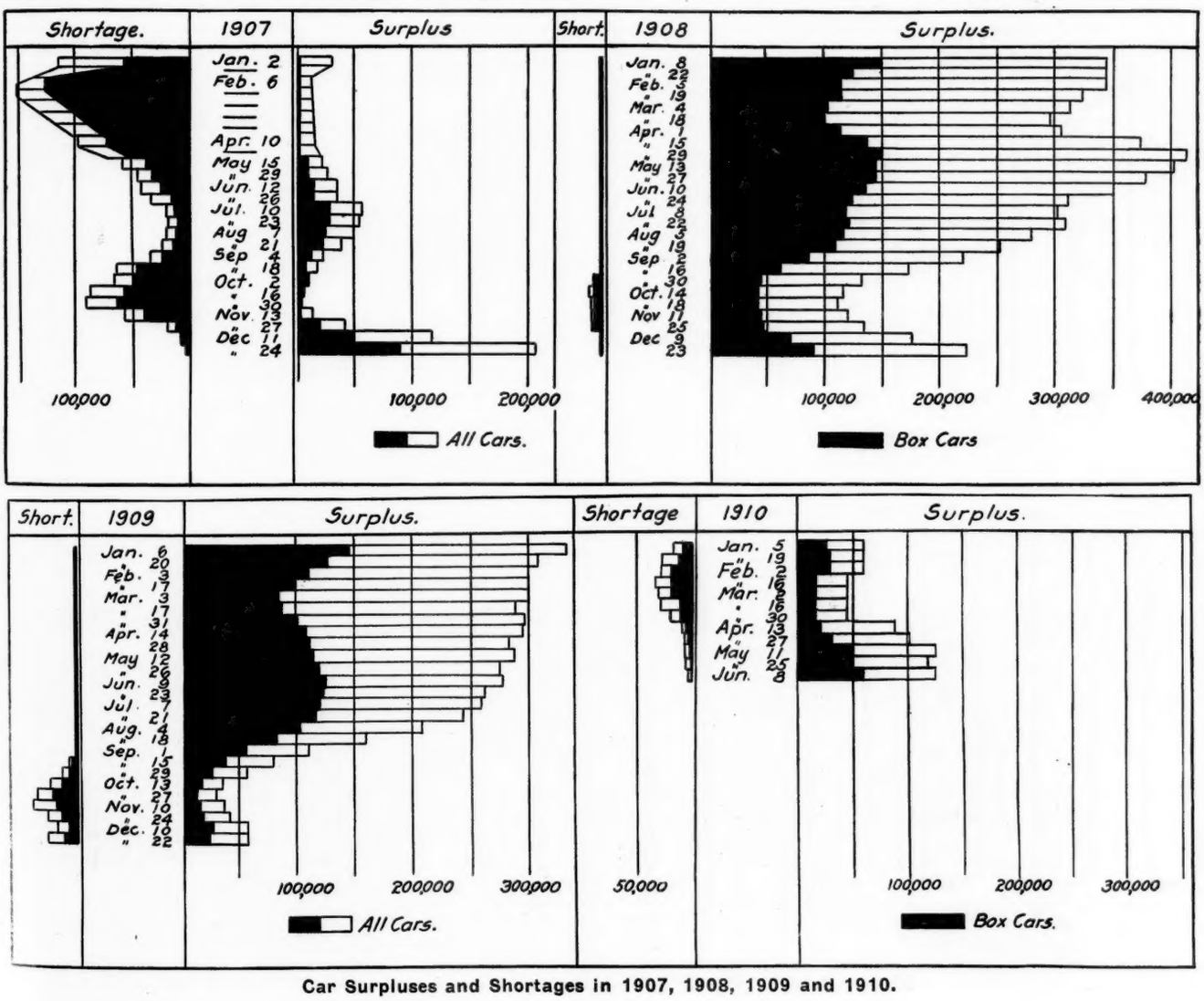
"This report shows an increase in the surplus of 14,118, making a total of 129,508. Of this increase, 7,811 are box cars and 5,629 miscellaneous, the latter being composed chiefly of coke cars in Group 2 (Eastern), and stock cars in Group 6 (Northwestern). The total surplus of coal cars is about stationary, although there are some changes in the group figures, Group 3 (Central) showing a reduction and Group 4 (North Atlantic) an increase."

The accompanying table gives surpluses and shortages by groups on June 8, and the charts show total surpluses and shortages in 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—June 8, 1910	8	141	.....	437	182	760	150	240	56	15	461
" 2.— " 8, 1910	22	9,413	220	4,455	14,750	28,838	.....	.....	37	2	39
" 3.— " 8, 1910	24	17,445	654	8,060	3,912	30,071	31	70	210	23	334
" 4.— " 8, 1910	10	2,273	37	2,653	1,474	6,437	50	427	600	30	1,107
" 5.— " 8, 1910	21	2,576	206	1,794	952	5,528	48	169	2	10	229
" 6.— " 8, 1910	19	6,737	334	3,983	5,756	16,810	299	.....	16	103	418
" 7.— " 8, 1910	4	1,053	67	96	559	1,775	.....	.....	.....	.....	.....
" 8.— " 8, 1910	14	7,854	500	6,324	3,453	18,131	3	3	22	3	31
" 9.— " 8, 1910	9	2,178	350	214	832	3,574	.....	.....	.....	1	1
" 10.— " 8, 1910	23	4,544	1,126	2,275	6,320	14,265	50	20	39	15	124
" 11.— " 8, 1910	5	1,923	5	60	1,331	3,319	253	14	.....	.....	267
Grand total	159	56,137	3,499	30,351	39,521	129,508	884	943	982	202	3,011

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, and North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909 and 1910.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1910.
(See also issues of June 10 and 17.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$86,673	$34,874	$131,226	$23,311	$17,222	$4,158	$43,138	$5,768	$93,597	$37,629	.....	$4,500	$33,129	$13,211
Alabama Great Southern	309	252,840	90,057	375,589	44,207	64,342	10,645	119,157	8,751	247,102	128,487	—1,091	11,522	115,874	18,934
Bessemer & Lake Erie	201	525,572	20,887	555,079	55,357	105,653	7,260	133,417	7,303	308,990	246,089	.....	6,000	240,089	193,594
Central New England	278	235,021	25,949	276,504	42,759	26,505	1,452	79,796	4,358	154,870	121,634	.....	11,500	110,134	—1,188
Chicago & Alton	998	543,861	314,796	945,770	87,824	108,426	37,589	386,039	33,397	653,275	292,495	—5,592	49,000	237,903	—67,316
Chicago & Erie	269	307,859	64,039	403,791	40,163	93,522	17,894	183,470	7,660	342,709	61,082	.....	10,938	50,144	3,830
Chicago, Indiana & Southern	329	273,815	19,697	309,712	51,630	63,741	7,738	114,676	7,844	245,629	64,083	—141	13,500	50,442	29,356
Chicago, Indianapolis & Louisville	616	349,905	119,374	516,891	59,313	74,236	15,001	169,945	14,697	333,192	183,699	.....	26,200	157,499	28,455
Chicago, Milwaukee & Puget Sound	1,466*	1,150,284	123,503	1,292,899	45,316	126,208	31,873	441,640	9,149	654,186	638,713	4,800	22,560	620,953	.....
Chicago, Milwaukee & St. Paul	7,511	3,916,456	1,147,035	5,480,335	699,719	656,383	49,508	2,393,498	101,563	3,900,671	1,579,664	1,791	216,040	1,365,415	72,570
Cincinnati, New Orleans & Texas Pac.	337	606,311	117,037	764,596	79,920	111,798	19,653	230,647	17,670	459,688	304,908	—2,768	20,000	282,140	48,591
Cumberland Valley	162	218,396	45,569	272,956	44,104	36,116	4,317	80,731	5,738	171,006	101,950	216	4,083	98,083	11,819
Duluth & Iron Range	168	392,053	23,842	425,674	89,966	49,529	265	89,970	8,250	237,980	187,694	—6,667	17,001	164,026	170,250
Duluth, Missabe & Northern	293	488,522	38,052	532,275	106,473	79,913	1,889	92,580	9,305	290,160	242,115	—1,625	21,394	219,096	224,105
Forth Worth & Denver City	454	263,474	116,236	396,972	44,322	69,635	6,953	125,105	15,226	261,241	135,731	—1,070	9,938	124,723	53,346
Iowa Central	558	214,726	38,183	264,866	43,227	51,812	7,991	113,038	8,629	224,697	40,169	.....	9,789	30,380	14,545
Minneapolis & St. Louis	1,027	297,609	79,006	402,417	60,421	54,932	10,638	172,218	12,795	311,004	91,413	31	19,266	72,178	55,913
Minneapolis, St. Paul & S. Ste. Marie	2,495†	740,829	261,101	1,070,988	125,086	134,373	18,272	354,363	21,992	654,086	416,902	—304	70,924	345,674	34,910
Missouri Pacific	3,883‡	1,517,411	354,463	2,080,568	349,765	328,091	63,250	896,019	69,848	1,706,974	373,594	—3,533	95,300	274,761	.....
New Orleans & North Eastern	196	230,699	53,423	304,368	33,754	40,365	11,004	99,569	10,185	194,877	109,491	.....	8,300	101,191	35,844
New York, Philadelphia & Norfolk	112	242,868	31,840	290,597	29,102	51,478	4,455	99,428	9,285	193,748	96,849	.....	6,850	89,999	27,017
New York, Susquehanna & Western	151	143,836	50,323	220,816	20,822	21,932	1,666	85,900	6,253	136,573	84,243	—201	11,317	72,725	—19,602
Northwestern Pacific	376	86,856	131,274	237,757	48,603	34,610	3,031	84,293	9,251	179,787	57,970	.....	10,988	46,982	15,261
Peoria & Eastern	351	177,881	51,467	249,291	39,734	35,683	5,535	96,738	5,790	183,480	65,811	.....	9,200	56,611	10,035
Pittsburgh & Lake Erie	191	945,310	122,446	1,103,080	156,409	117,232	16,374	316,544	22,199	628,758	474,322	—442	27,200	446,680	83,759
Rutland	468	144,146	79,535	254,661	38,875	34,591	6,096	91,694	6,437	177,694	76,967	.....	9,096	67,871	256
St. Louis, Iron Mtn. & Southern	3,287§	1,565,421	449,687	2,201,796	363,045	323,374	61,016	750,082	77,139	1,574,656	627,140	—5,580	87,820	533,740	41,446
San Antonio & Aransas Pass	727	190,624	73,235	280,917	59,848	52,277	3,958	120,621	10,897	247,601	33,316	.....	9,000	24,316	—22,178
San Pedro, Los Angeles & Salt Lake	979‖	197,946	78,862	296,179	164,071	73,230	16,059	125,558	15,619	394,537	—98,358	899	22,430	—119,889	—373,884
Spokane, Portland & Seattle	430¶	272,451	82,775	387,133	49,571	24,298	4,500	116,597	6,650	201,616	185,517	—162	20,738	164,617	120,554
Toledo, St. Louis & Western	450	239,563	32,243	291,950	26,304	45,877	7,801	98,487	8,840	187,309	104,641	.....	13,900	90,741	—5,722
Vicksburg, Shreveport & Pacific	171	60,862	33,539	103,730	20,617	21,735	3,753	33,422	4,357	83,884	19,846	.....	6,525	13,321	—1,321
Virginian	444°	192,330	15,794	216,482	24,470	40,552	4,694	60,812	7,501	138,029	78,453	355	13,000	65,808	.....
West Jersey & Seashore	356	144,286	231,381	402,555	95,923	54,820	14,702	176,290	8,990	350,725	51,830	—1,052	20,037	30,741	—58,046
Wheeling & Lake Erie	458	387,559	42,003	468,938	70,630	78,021	6,626	176,501	14,143	345,921	123,017	579	19,689	103,907	35,762
Wisconsin Central	1,076	631,382	126,712	806,587	92,578	97,737	17,767	299,738	14,813	522,633	283,954	904	32,046	252,812	79,335
TEN MONTHS OF FISCAL YEAR, 1910.															
Alabama & Vicksburg	143	$912,333	$389,598	$1,400,863	$211,645	$214,795	$37,964	$432,356	$52,397	$949,157	$451,706	.....	$43,701	$408,005	$147,168
Alabama Great Southern	309	2,291,694	875,148	3,470,546	408,960	751,489	92,116	1,034,919	90,503	2,377,987	1,092,559	—$6,927	113,504	972,128	179,388
Bessemer & Lake Erie	201	5,817,674	271,373	6,176,023	596,256	1,060,693	73,290	1,521,673	97,453	3,349,365	2,826,658	.....	93,210	2,733,448	1,046,121
Central New England	278	2,082,075	280,896	2,495,920	400,194	221,371	15,591	739,496	32,770	1,409,422	1,086,498	.....	80,000	1,006,498	247,109
Chicago & Alton	998	6,965,073	3,462,671	11,320,094	1,295,036	1,310,062	392,943	3,971,911	309,504	7,279,456	4,040,638	—16,407	371,000	3,653,231	—318,874
Chicago & Erie	269	3,315,022	659,714	4,331,618	462,552	911,694	161,680	1,826,273	87,820	3,450,019	881,599	.....	109,385	772,214	374,018
Chicago, Indiana & Southern	329	2,910,181	219,278	3,209,361	430,369	570,427	85,012	1,091,744	82,165	2,259,717	949,644	106	128,503	821,247	390,257
Chicago, Indianapolis & Louisville	616	3,355,140	1,199,930	4,972,274	661,902	674,567	142,543	1,622,866	150,736	3,252,614	1,719,660	.....	218,300	1,501,360	428,023
Chicago, Milwaukee & Puget Sound	1,466*	7,291,830	757,734	8,196,700	378,186	619,109	213,507	2,666,700	101,526	3,979,028	4,217,672	28,579	190,241	4,056,010	.....
Chicago, Milwaukee & St. Paul	7,511	37,798,854	11,955,072	53,974,704	7,050,475	6,417,031	1,004,677	21,989,070	957,456	37,418,709	16,555,995	171,996	2,097,291	14,630,700	—1,803,193
Cincinnati, New Orleans & Texas Pac.	337	5,792,441	1,296,759	7,464,557	810,576	1,363,423	196,265	2,056,533	178,911	4,605,708	2,858,849	—3,502	200,000	2,655,347	625,657
Cumberland Valley	162	1,827,934	500,226	2,431,410	335,039	264,980	43,015	729,729	60,418	1,433,181	998,229	4,996	40,836	962,389	70,047
Duluth & Iron Range	168	6,928,965	227,218	7,235,298	870,046	548,493	3,452	1,248,788	103,545	2,774,324	4,460,974	2,579	339,380	4,124,173	1,336,202
Duluth, Missabe & Northern	293	9,453,264	353,421	9,877,264	896,346	860,901	15,515	1,381,038	119,316	3,273,116	6,604,148	25,659	481,654	6,148,153	1,801,038
Forth Worth & Denver City	454	2,801,379	1,428,204	4,422,341	463,172	577,484	66,109	1,318,114	146,023	2,570,902	1,851,439	—5,455	86,272	1,759,712	462,399
Iowa Central	558	2,266,625	453,873	2,841,523	350,309	444,472	85,502	1,199,343	90,029	2,169,655	671,868	.....	78,940	592,928	154,316
Minneapolis & St. Louis	1,027	2,853,353	1,002,712	4,126,543	437,950	484,700	125,094	1,637,373	133,196	2,818,293	1,308,250	—610	189,704	1,117,936	111,402
Minneapolis, St. Paul & S. Ste. Marie	2,495†	8,961,276	2,946,414	12,580,381	1,098,676	1,293,002	234,388	3,610,352	222,444	6,458,862	6,121,519	101,047	730,869	5,491,697	1,540,963
Missouri Pacific	3,883‡	14,021,142	3,411,475	19,251,214	3,019,640	2,889,284	510,385	7,822,930	549,087	14,791,326	4,459,888	—32,410	715,360	3,712,119	.....
New Orleans & North Eastern	196	2,141,755	518,872	2,880,780	288,010	434,989	91,675	955,864	105,879	1,876,417	1,004,363	.....	82,224	922,138	197,374
New York, Philadelphia & Norfolk	112	2,187,210	327,674	2,690,305	276,291	456,633	35,065	952,913	92,818	1,813,720	876,585	.....	64,900	811,685	178,077
New York, Susquehanna & Western	151	1,467,187	526,219	2,242,733	253,553	214,796	16,056	840,644	41,895	1,366,944	875,789	—38,133	113,167	724,489	—32,806
Northwestern Pacific	376	1,036,164	1,307,733	2,551,534	462,829	331,571	26,234	897,709	95,581	1,813,924	727,610	.....	107,846	629,764	153,742
Peoria & Eastern	351	1,946,317	584,016	2,721,083	306,628	471,836	53,925	966,398	52,063	1,850,850	870,233	.....	88,594	781,639	215,026
Pittsburgh & Lake Erie	191	12,615,864	11,231,326	14,208,130	1,383,067	1,134,264	141,048	3,125,756	209,336	5,993,471	8,214,659	—3,852	209,036	8,001,770	3,322,382
Rutland	468	1,446,540	903,762	2,634,197	365,726	367,379	63,768	971,375	57,213	1,825,461	808,736	.....	97,194	711,541	128,439
St. Louis, Iron Mtn. & Southern	3,287§	16,223,155	4,498,504	22,488,460	3,326,476	3,105,593	563,416	7,031,928	694,290	14,721,703	7,766,757	—52,008	738,999	6,975,750	1,059,504
San Antonio & Aransas Pass	727	2,295,524	842,338	3,318,735	535,202	442,901	45,004	1,244,485	90,763	2,358,355	960,380	.....	90,000	870,380	—28,800
San Pedro, Los Angeles & Salt Lake	979‖	3,033,841	1,915,460	5,300,684	1,180,679	931,128	241,023	1,832,503	162,127	4,347,460	953,224	—14,789	239,656	698,779	—958,796
Spokane, Portland & Seattle	430¶	2,065,530	659,589	2,852,766	503,321	270,113	32,911	983,303	66,297	1,855,946	996,821	—1,542	252,175	743,104	611,982
Toledo, St. Louis & Western	450	2,576,300	375,759	3,145,296	360,555	464,807	74,718	1,027,651	87,614	2,015,345	1,129,951	.....	125,700	1,004,251	64,161
Vicksburg, Shreveport & Pacific	171	705,765	389,431	1,190,816	216,664	215,736	34,700	352,717	44,239	864,056	326,760	.....	65,243	261,517	41,676
Virginian	444°	1,419,066	171,972	1,662,414	249,374	292,448	56,580	495,984	73,545	1,167,931	494,483	4,223	118,667	380,039	.....
West Jersey & Seashore	356	1,392,865	2,902,850	4,599,995	825,429	553,909	135,352	1,890,190	87,660	3,492,540	1,107,455	1,296	200,371	908,381	81,854
Wheeling & Lake Erie	458	4,844,267	474,481	5,711,544	590,813	1,212,443	69,616	1,971,384	137,989	3,982,245	1,729,299	77,425	219,115	1,587,609	604,116
Wisconsin Central	1,076	5,626,899	1,243,824	7,280,518	881,673	964,890	217,652	2,536,904	163,504	4,764,623	2,515,895	7,199	302,554	2,220,541	465,960

* Began operations on August 1, 1909. † Mileage operated on April 30, 1909, 2,395 miles. ‡ Began operations on August 9,1909. § Mileage on April 30, 1909, 2,608 miles. ‖ Total mileage 1,099 miles, of which 126 miles not operated in April, 1910, on account of washout. ¶ Mileage operated on April 30, 1909,, 273 miles. ° Began operations on July 1, 1909. — Indicates Deficits, Losses and Decreases.

INTERSTATE COMMERCE COMMISSION.

Unjust to Apply New Rates to Shipments a Year Back.

Central Lumber Company v. C., M. & St. P. et al. Opinion by Commissioner Harlan.

To accord to complainant's shipments the benefit of a proportional rate from Aberdeen, S. Dak., to Scranton, N. Dak., established about a year after certain carload shipments of lumber had reached Aberdeen on local billing from points in Washington, and as much as five months after most of it had reached Scranton as local movements from Aberdeen, would be in violation of every principle involved in the administration of this law. Petition dismissed. (18 I. C. C., 495.)

Unlawful Use of Tap Line Proportion.

Theo. Fathauer Company v. St. Louis I. M. & S. et al. Opinion by Commissioner Cockrell.

The Iron Mountain road, with the concurrence of the Mississippi, Arkansas & Western, a tap line, published lumber rates from Shults, Ark., a point on the tap line, via Blissville, Ark., the junction point, one cent higher than the rates from Blissville, and allowed the tap line a proportion of two cents thereof. Notwithstanding complainant's shipments were loaded into cars furnished by the Iron Mountain on a spur of the tap line within the corporate limits of Blissville, and from the lumber pile situated adjacent to the Iron Mountain siding at Blissville, the tap line billed said shipments as from Shults; held, that the exaction of the Shults rate was unreasonable to the extent that it exceeded the rate from Blissville on the Iron Mountain. Reparation awarded. Allowance made by the Iron Mountain to the tap line unlawful. (18 I. C. C., 517.)

Duty of Intermediate Carrier to Route Correctly.

Duluth & Iron Range v. C., St. P., M. & O. Opinion by Commissioner Harlan.

Rule 214 of Conference Rulings, Bulletin No. 4, is of continuing application through to destination upon all carriers participating in a movement and does not leave connecting lines in a state of irresponsibility with respect to routing when they accept shipments from an initial carrier without instructions. A connecting line receiving a shipment without instructions may demand instructions from the initial carrier, but if, instead of pursuing that course, it assumes the responsibility of routing the shipment it must accept the resulting liability for any damage in the way of increased charges that necessarily and directly flows from its mistake in selecting the wrong route. It is not excused by the fact that the shipper had given correct routing instructions which the initial carrier had neglected to note on the transfer billing. Connecting lines from the nature of their larger traffic and wider opportunities for knowing what are the reasonably direct routes ought in many cases to relieve small initial carriers of the responsibility for correct routing. (18 I. C. C., 485.)

Railway Not Bound to Use an Ocean Rate Not Filed.

W. G. Hagar Iron Company v. Pennsylvania et al. Opinion by Commissioner Clements.

Rates not on file with the commission cannot be used in constructing a through charge. Under routing instructions given by itself, the complainant shipped on a through bill of lading from Breckenridge, Pa., over the Pennsylvania Railroad, the Atlantic Steamship Company, and the Galveston, Harrisburg & San Antonio Railway through the ports of New York and Galveston to Houston, Tex., a carload of steel plates weighing 44,280 lbs., freight charges being assessed on the basis of a combination through rate of 59 cents, constructed of a rate of 16 cents over the Pennsylvania to New York and a joint water-and-rail rate of 43 cents beyond. The complainant claims reparation based upon a combination rate of 32 cents, formed thus: Breckenridge to New York, 16 cents; port-to-port rate New York to Galveston, 10 cents; reconsignment charge at Galveston of 1 cent; and a local rate within the state of Texas from Galveston to Houston of 5 cents. The only rates on file with the commission by which the through rate could possibly have been constructed were the factors actually used. The port-to-port rate New York to Galveston, the reconsignment charge at Galveston, and the intrastate rate Galveston to Houston were not on file, and for this reason we hold that they were not factors to be used in constructing the through charge involved. The complaint is dismissed. (18 I. C. C., 529.)

Sawdust Rate Should Not be Higher Than Wood Fuel Rate.

William Plummer Company v. Northern Pacific. Opinion by Commissioner Cockrell.

Rate on carload of sawdust from East Grand Forks, Minn., to Minnewaukan, N. Dak., found to be unreasonable to the extent that it exceeded rate on wood for fuel. Reparation awarded.

At the time of shipment sawdust was carried in the Western Classification under Class E, which made the rate between East Grand Forks and Minnewaukan 17 cents. This rate could not apply, however, as defendant's tariff provided for the application to sawdust of the specific commodity rate on lumber for 20 cents, which was collected. Subsequent to the hearing sawdust was withdrawn from the commodity tariff on lumber, and the rate now applicable is Class E, or 17 cents.

Complainant, in support of its contention that sawdust should take the same rate as wood for fuel, cited the tariffs of several carriers operating in Minnesota and North Dakota. Defendant alleges that very little sawdust moves for fuel, but that it generally moves for icing purposes and that the Class E rate is the ordinary classification.

Sawdust is a low-grade commodity, and it was stated at the hearing and not disputed that it was valued at about $1.50 per ton, or about the cost of shoveling it into the car.

Under all the circumstances we find that the rate exacted was unreasonable in and to the extent that it exceeded the fuel-wood rate of 8 cents per 100 lbs. (18 I. C. C., 530.)

Charges for Dunnage, Etc., at Cost Not Unreasonable.

Davies v. Louisville & Nashville et al. Opinion by Chairman Knapp.

The commission is unable to find that defendants have charged more for loading and furnishing material and placing dunnage on shipments of fruits and vegetables from Gibson and Humboldt, Tenn., to Chicago, Ill., than the cost of the service, and it is therefore constrained to hold that the charge is not unreasonable.

Complainant's contention that it is the duty of defendants to load, strip and brace carload shipments of fruits and vegetables at their own expense, for the reason that this service is included in the carload rate, is not tenable because the tariffs of the principal defendant provide that shippers shall load and unload carload shipments.

There is no allegation in the complaint that challenges the reasonableness of either the carload or less-than-carload rates on shipments of tomatoes from Gibson and Humboldt to Chicago, except as the claim is made that by adding the loading and bracing charges to carload rates a higher total charge results than would be imposed on the same amount of freight transported at less-than-carload rates. No evidence was submitted with respect to the reasonableness of the rates on either of them, and no finding can therefore properly be made with respect thereto.

It was the practice of the Armour Car Lines to load fruits and vegetables and furnish and place dunnage, etc. Charges for this service seem to have been included in the icing charges which followed shipments and were paid by consignees.

The carload rate on tomatoes from Humboldt to Chicago is 39.6 cents per 100 lbs., minimum 20,000 lbs., and the less-than-carload rate 44 cents per 100 lbs. A charge of $10 per car for loading, bracing, etc., carload shipments of tomatoes

miles, of which 126 miles not operated in April, 1910.
Decreases.

makes the total charge more than would result from the application of tariff rates to the same weight in less-than-carload shipments. The record does not show that this anomalous adjustment is applicable to any large number of commodities. Under the circumstances it appears that the spread between the carload and less-than-carload rates on tomatoes between Humboldt and Chicago is out of line, and there is nothing in the record which justifies such an adjustment.

It is suggested to the Louisville & Nashville that there appears to be no justification for the existing relation of carload and less-than-carload rates. * * * Complaint dismissed. (18 I. C. C., 540.)

STATE COMMISSIONS.

The Indiana Railroad Commission has issued an order relieving the Indianapolis Union from installing automatic block signals. The fact that the company is elevating its tracks and proposes to enlarge the Union Station, through which the tracks pass is deemed good reason for postponing the work. The commission, however, reserved the right to modify its order and require a block system to be installed whenever deemed proper.

New York.—See Court News.

COURT NEWS.

The Supreme Court of New York, appellate division, first department, in the case of Gardiner against the New York Central, sustains the road in its defense that on a 50-trip ticket, sold at a reduced rate, the baggage liability of $50, printed thereon, is valid. The plaintiff sought to collect $1,369 for a piece of baggage that was lost.

The United States Circuit Court of Appeals holds that the Interstate Commerce Commission has no power to regulate fares on street railways extending from one city to another where the two cities are in different states. This decision nullifies the opinion of the commission, reported in the *Railway Age Gazette* December 24, page 1255, declaring excessive the rates charged by the Omaha & Council Bluffs Street Railway from certain points in Omaha, Neb., to certain other points in Council Bluffs, Iowa.

The supreme court of the United States has upheld the Indiana State Employers' Liability Act, thereby sustaining the Indiana supreme court. Spencer Melton, a bridge carpenter on the Louisville & Nashville, was injured, and the accident was alleged to have been due to defective tools. The road contended that the liability law was unconstitutional and alleged that a bridge carpenter was not a direct employee of a railway. The Indiana supreme court held the law valid and that decision is now sustained.

The Court of Errors and Appeals of New Jersey has affirmed the judgment of the Supreme Court directing the State Board of Assessors to make a revaluation of the so-called second-class property of certain railways in Jersey City. The property in question is that used for railway purposes, but is not included in the main stem or hundred-foot right of way, from the taxation of which the state derives a large part of its revenue. The tax on second-class property goes to the municipality in which it is located. The decision is a substantial victory for the railways in their fight against increased taxation.

The New York State Court of Appeals has sustained the lower court in its decision, issued some months since, imposing a small fine on the New York Central for issuing equipment bonds without first applying to the Public Service Commission. The bonds—equipment trust certificates to the amount of $30,000,000—were issued in November and December, 1907. The commission held, under section 55 of the Public Service Commission law, that the consent of the commission was necessary. The controversy was submitted for the purpose of obtaining the construction of the law and the commission asked for only a nominal penalty. This decision does not affect the validity of the certificates, but will make it clear that the statute applies to such securities.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

R. H. Baker has been elected president of the Texas Central, succeeding Henry K. McHarg.

E. M. Alvord has been appointed vice-president and general manager of the Midland Valley, with office at Muskogee, Okla.

John F. Stevens, president of the Oregon Trunk Railway, and general manager of the Oregon Electric Railway Co., has been elected also president of the Pacific & Eastern, which was recently taken over by the Hill interests, with office at Portland, Ore., succeeding John R. Allen, resigned. J. W. Lawlor has been appointed secretary, succeeding C. P. Humphrey.

In the future all vice-presidents of the Canadian Pacific will be on an equal footing, and the titles are no longer numbered. William Whyte is now vice-president at Winnipeg, Man., with the same duties as heretofore; I. G. Ogden, vice-president at Montreal, Que., in charge of the financial and accounting departments, and G. M. Bosworth, vice-president at Montreal, in charge of the company's traffic and ocean steamship lines.

Operating Officers.

J. Irwin has been appointed superintendent of the Fifth district of the Canadian Northern, with office at Saskatoon, Sask.

E. L. Crimmen has been appointed chief train despatcher and car accountant of the South Dakota Central, with office at Sioux Falls, S. D.

T. H. Yorke has been appointed assistant superintendent of the Washington division of the Oregon Railroad & Navigation Co., with office at Spokane, Wash., succeeding J. F. Quinn, assigned to other duties.

C. D. Rowe, chief despatcher of the Trinity division of the Missouri, Kansas & Texas, has been appointed trainmaster, succeeding W. Rudd, whose appointment as superintendent has been announced in these columns.

H. L. Hungerford, superintendent of the Danville division of the Southern Railway, at Greensboro, N. C., has been appointed superintendent of the Charlotte division, with office at Greenville, S. C., succeeding B. G. Fallis, promoted.

C. B. Fletcher, division superintendent of the Illinois Central, with headquarters at Fort Dodge, Ia., has resigned. G. W. Berry, trainmaster at Carbondale, Ill., succeeds Mr. Fletcher. G. S. Rought, assistant trainmaster at Mound, Ill., succeeds Mr. Berry.

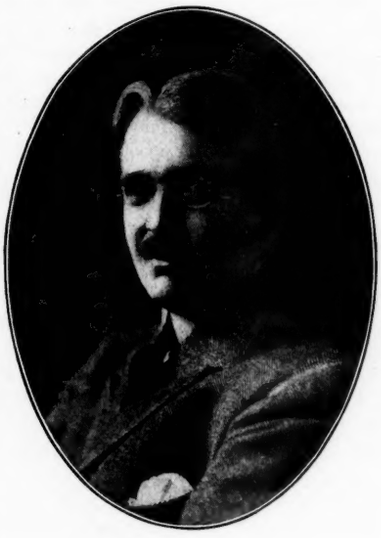
F. M. Hawley, trainmaster of the Delaware and Jefferson divisions of the Erie Railroad at Susquehanna, Pa., has been appointed trainmaster of the Susquehanna division and branches, with office at Hornell, N. Y., succeeding C. D. Taylor, promoted. J. J. Mantel succeeds Mr. Hawley, with office at Susquehanna.

F. W. Stanyan, treasurer and general superintendent of the Montpelier & Wells River, has been appointed general manager, succeeding W. A. Stowell, resigned, effective July 1. The office of general superintendent will be abolished and heads of departments now reporting to the general superintendent will thereafter report directly to and be governed by the orders of the general manager.

Edward J. Lambert, whose appointment as superintendent of transportation of the Missouri, Kansas & Texas, with office at Denison, Tex., has been announced in these columns, was born June 17, 1864, at Crestline, O. He began railroad work in 1878 as messenger, clerk and night yard despatcher of the Pittsburgh, Fort Wayne & Chicago, at Fort Wayne, Ind., and continued with this company in various positions until 1887.

From 1887 to 1892 he served a number of minor railway companies, and in the latter year became assistant agent and local freight agent of the Illinois Central at Chicago. He held a number of positions with this company, resigning in 1901 to become trainmaster of the Atchison, Topeka & Santa Fe, at Fresno, Cal. In the same year he entered the service of the Missouri, Kansas & Texas, and has been in the freight department of that company until his recent appointment as superintendent of transportation.

Frank E. McCormack, whose appointment as superintendent of the Rochester division of the New York Central & Hudson River, with office at Rochester, N. Y., has been announced in these columns, was born September 11, 1867, at Lamson, N. Y. He began railway work as a water boy in 1881 on the Delaware, Lackawanna & Western, and was later telegraph operator on that road. In 1885 he went to the Rome, Watertown & Ogdensburg as operator and pumper, and since that time has been in the continuous service of that company and its successor, the New York Central & Hudson River. In 1890 he was appointed train despatcher of the Watertown district, and four years later was made chief despatcher. From 1896 to 1900 he was trainmaster of the Carthage district, and for the following five years was trainmaster of the Watertown district, becoming chief trainmaster in 1905 of the Rome, Watertown & Ogdensburg division. A year later he was appointed assistant superintendent of the same division. In September, 1908, he was appointed superintendent of the Ontario division, at Oswego, N. Y., which position he held at the time of his recent appointment as superintendent of the Rochester division.



F. E. McCormack.

Traffic Officers.

H. J. Maxwell has been appointed a general agent of the Quincy Western, with office at San Francisco, Cal.

Howard B. Chappel has been appointed freight solicitor of the Union line at Chicago, succeeding William J. Baar, promoted.

H. S. Lincoln has been appointed assistant to the vice-president, in charge of traffic of the Southern Pacific, with office at San Francisco, Cal.

Homer W. Watson has been appointed a commercial agent of the Macon & Birmingham, at Nashville, Tenn., succeeding Harry H. Hill, resigned.

E. P. Lannan, dairy agent of the Frisco lines, has been appointed assistant general perishable freight agent. L. E. Gailey succeeds Mr. Lannan.

Walter A. Springall has been appointed a commercial agent of the San Antonio & Aransas Pass, at San Antonio, Tex., succeeding E. S. Trust, deceased.

E. K. Bixby, chief clerk to the assistant general passenger agent of the Pennsylvania lines, with office at Chicago, has been appointed district passenger agent.

Frank Sprayer, station agent of the Chicago, Indianapolis & Louisville, at Delphi, Ind., has been appointed a traveling freight agent, with office at Lafayette, Ind.

J. M. Killian has been appointed traffic manager and auditor of the Stephenville, North & South Texas, with office at Stephenville, Tex., succeeding W. G. Little, resigned.

A. T. Thomson, secretary and treasurer of the Arizona & New Mexico and the Lordsburg & Hachita, at Clifton, Ariz., has been appointed traffic manager of the Arizona & New Mexico, with office at Clifton.

Donald P. Stubbs, chief of the tariff bureau of the Oregon Short Line, with office at Salt Lake City, Utah, has been appointed general agent of the Harriman Lines, with office at Cleveland, O., effective July 1.

A. E. Brown, traveling freight and passenger agent of the Colorado Midland, with headquarters at Chicago, has been appointed traveling freight agent of the Minneapolis, St. Paul & Sault Ste. Marie, at Cincinnati, O., succeeding C. D. Dooley, resigned, to go into business.

F. C. Reilly has been appointed general freight agent and W. H. Richardson, general passenger agent, of the Evansville & Terre Haute, the Evansville & Indianapolis and the Evansville Belt, with offices at Evansville, Ind., succeeding D. H. Hillman, general freight and passenger agent, assigned to other duties.

Edwin H. Coombs, whose appointment as assistant general freight agent of the Missouri, Kansas & Texas, with office at Houston, Tex., has been announced in these columns, was born September 7, 1869. He is a graduate of Ogden College, Bowling Green, Ky. Mr. Coombs began railway work in 1896 as clerk in the office of the assistant general freight agent of the Missouri, Kansas & Texas, at Houston, Tex., and he has been continuously in the service of this company until the present time, serving as contracting agent, at Galveston, Tex., and commercial agent consecutively at Dallas, Denison and San Antonio. He resigns the latter position to become assistant general freight agent with office at Houston, Tex.

Engineering and Rolling Stock Officers.

G. H. Brown has resumed his duties as division engineer on the Philadelphia division of the Pennsylvania Company.

OBITUARY.

W. C. Rinearson, general passenger agent of the Queen & Crescent lines, at Cincinnati, Ohio, died recently in Merion, a suburb of Philadelphia, Pa., after a long illness. Mr. Rinearson was born on March 19, 1853, and entered railway service on the Baltimore & Ohio in the passenger department at Pittsburgh, Pa. Later he was for 11 years traveling passenger agent for the Pennsylvania Company. On December 1, 1887, he was appointed assistant general passenger agent of the New York, Pennsylvania & Ohio, now a part of the Erie Railroad, and about three years later he was made general passenger agent of the New York, Lake Erie & Western. In June, 1892, he was appointed general traveling passenger agent of the Chicago Great Western and the following year was made general passenger agent of the Cleveland, Akron & Columbus. He was appointed general passenger agent of the Cincinnati, New Orleans & Texas Pacific in September, 1893, and since that time has been at the head of the passenger department of the Queen & Crescent lines.

FOREIGN RAILWAY NOTES.

A decree provides for the extension of the Northeastern Railway of Uruguay from Melo to Artigas, a town of some importance on the Yaguaron, instead of to Centurion. Both towns are on the Brazilian border, the former being accessible to ocean-going vessels.

From about July 1 the journey from Buenos Ayres to Valparaiso can be made by railway in 35 hours. Passengers will have to change cars at Mendoza, Argentina, as the Great Western Railway from Buenos Ayres to that city is broad gage, while the Trans-Andean Railway is very narrow gage. Another change must be made at Los Andes from the Trans-Andean to the Chilean State Railway.

Railway Construction.

New Incorporations, Surveys, Etc.

Alaska Northern.—An officer writes that this company has track laid on 71 miles from Seward, Alaska, north. The company expects to have 170 miles of line ready next month for inspection by contractors preparatory to their being asked for bids on work to cost about $7,000,000. The line is eventually to be extended north via Fairbanks and Chena to Chatanika. O. G. Laberee, president and general manager, Seattle, Wash., and A. W. Swanitz, chief engineer, Seward. (June 10, p. 1436.)

Berkshire Street Railway.—See New York, New Haven & Hartford.

Bridgeport & Danbury (Electric).—Application has been made in Connecticut for a certificate of public necessity to build an electric line from Bridgeport, Conn., northwest via Trumbull, Monroe, Newtown and Bethel to Danbury, about 20 miles. The company has a capital of $1,500,000 and headquarters at 137 Housatonic avenue, Bridgeport.

California Roads.—At a recent meeting in Fresno, Cal., residents of that place decided to organize a company with a capital of $4,000,000 for the purpose of building an electric line from Fresno southwest to Coalinga, thence northwest to Monterey. It is expected that construction work will be begun in 60 days and the line finished as far as Coalinga in nine months, and to tidewater at Monterey in two years. A. P. May, Coalinga; A. G. Metz and H. N. O'Bryan, Monterey; A. B. Weiler and E. R. Shaw, San Francisco, are interested.

Canadian Northern Quebec.—According to press reports a contract has been given to J. P. Mullarkey, Montreal, Que., to build the line from Hawkesbury, Ont., east to Montreal. (June 10, p. 1436.)

Canadian Pacific.—According to press reports a contract has been given to Foley, Welch & Stewart to build the first 25 miles of the Kootenay Central from Galloway, B. C., on the Crow's Nest Line, north via Fort Steele.

Central Arkansas & Eastern.—An officer writes that this company is now operating a line from England, Ark., on the Little Rock branch of the St. Louis & Southwestern, east to McGugor, 12 miles, and proposes to build an extension from McGugor east to Stuttgart, 18 miles, also another extension from a junction point two miles from Stuttgart north to Hazen, 16 miles. Contracts for grading, bridging and track laying have been let to John Scott & Sons, St. Louis. The bridges are all to be pile structures, and 60-lb. relaying rails will be used. All the rails, track material and equipment have been ordered. A. M. Van Auken, chief engineer, Stuttgart.

Chicago & Wisconsin Valley.—Incorporated in Wisconsin, with $40,000 capital, to build from Merrill, Wis., south to Janesville, 180 miles. The directors include: A. J. Behymer, J. E. Jones, R. H. Williams, J. W. Purves, J. R. MacMillian and T. W. Potts.

Chicago, Blue Island & Joliet (Electric).—This company was recently organized to build an electric line connecting the Chicago & Southern with the Joliet & Southern near Frankfort, Ill. The company has given a mortgage to secure an issue of $500,000 of bonds. W. H. Conrad, president, and W. H. Merrill, secretary, Chicago.

Decatur Southern Traction.—An officer writes that financial arrangements have been made and contracts will be let about August 1 to build from Decatur, Ill., south through Macon and Assumption to Pana, about 30 miles. Maximum grades will be 1.4 per cent. and maximum curvature 4 degs. There will be a bridge over the Sangamon river. R. McCalman, chief engineer, 318 Citizens T. & T. building, Decatur.

Fort Wayne & Winona Traction.—Organized in Indiana, with $100,000 capital, to build an electric line paralleling the Pennsylvania Lines West from Fort Wayne, Ind., west to Warsaw, 39 miles. The estimated cost of the line is $1,000,000. Surveys are now being made. J. A. Barry, E. W. Cook, E. G. Hoffman and G. M. Leslie, Fort Wayne, and R. A. Barry, New York, are interested.

Halifax & Eastern.—A charter has been granted this company, with a capital of $3,000,000, in Nova Scotia, to build a line from Dartmouth, Halifax Harbor, N. S., east to Country Harbor, with a branch from this line to the Intercolonial Railway at or near New Glasgow. The charter provides that the line must be built and in operation within two years. T. Goff, Toledo, Ohio; J. Bertram, Toronto, Ont., and S. Hirsh, London, are directors.

Hilo (Honolulu).—This road is to be extended from Hakalau to Paauilo, and the stockholders have authorized the issue of $1,000,000 in bonds and $1,000,000 in stock. The bonds have been sold to T. H. Davies & Co.

Kootenay Central.—See Canadian Pacific.

McCrory & Beedeville Southern.—An officer writes that contracts have been let and the right-of-way has been cleared for 11 miles. The company was organized to build a 14-mile line from McCrory, Ark. C. Hailey, president, and G. G. McCrory, chief engineer, McCrory.

Mexican Roads.—According to a Consular report from Hermocillo, Sonora, Mex., a concession has been given to Raymon de Negri and associates, to build from Ures to Kino bay, 168 miles. The line will traverse a mining and farming section. The concession provides that work on the line must be started within six months and finished in about two years. It is expected that the line will be finished in less than two years.

Mexico, Santa Fe & Perry Traction.—This company has filed a mortgage to secure an issue of $1,600,000 of bonds. The company was incorporated in April, 1907, and has partly constructed a line between Mexico, Mo., and Perry, about 27 miles. The line is eventually to be extended north to Hannibal, Mo., a total of 103 miles. M. Crum, president, Mexico.

Missouri, Oklahoma & Gulf.—According to press reports work is to be started as soon as the survey is finished for the extension from the present northern terminus at Wagoner, Okla., north towards Kansas City, Mo. (May 13, p. 1237.)

Montezuma & Western.—According to press reports work is to be started in July on the line from Denver, Colo., southwest to Leadville, about 125 miles. The project is backed by Denver capitalists. (June 10, p. 1437.)

Mount Hope, Patch Grove & Bagley.—A company is being organized to build a line from Bloomington, Wis., to connect with Mount Hope, Patch Grove and Bagley. William Leighton, president; H. Young, vice-president, and W. E. Lewis, secretary and treasurer.

New York, New Haven & Hartford.—This company has petitioned the Massachusetts railroad commissioners for permission to build an extension from the Southbridge branch, near the terminus at Southbridge, Mass., northwest 19.3 miles, to connect with the Central Vermont at Palmer. The total cost will be $2,810,000. Surveys for this line were made in the summer of 1907. This seems to be designed to forestall the Grand Trunk, which proposes to build over the same route. There is already an electric line in operation between these places.

The company is preparing to establish a large new freight yard near Woonsocket, R. I. It is said that the land on which this yard is to be laid out and which was secured some time ago, lies directly across the path which the Grand Trunk will desire to use in its proposed new line through southern Massachusetts and Rhode Island to Providence.

The law which was recently passed in Massachusetts provides that the New Haven may buy the whole or part of the Berkshire Street Railway, and also provides that the company shall before January 1, 1913, construct new lines of street railway as follows: From some convenient point in the town of Huntington to connect with the present line; a line to the summit of Greylock mountain; a line from the present terminus in Great Barrington through the town of Ashfield to the Connecticut boundary; a line connecting the town of Egremont with the road, and extensions, double-tracking and reconstruction in the cities of North Adams and Pittsfield as shall be requested by the mayors and boards of aldermen.

Norfolk & Western.—An officer writes that the work started during the early part of 1910 includes continuation of double-track construction in Ohio on 49.7 miles, and if the

plans are carried out, the line between Kenova, W. Va., and Columbus, Ohio, will be double-tracked early next year.

In West Virginia some gaps are being closed in the double-track line. This work is being carried out between Vivian and Huger on about 5.5 miles, and includes four tunnels, as well as on a section between Wyoming and Devon, 12 miles.

The Dry Fork branch, formerly known as the Iaeger & Southern, is being extended up Dry Fork, 0.75 miles, to No. 4 operation of the New River & Pocahontas Consolidated Coal Co.

Work has been started on a tunnel to be 4,700 ft. long, on the Indian Creek branch, for which a contract has been given to David W. Flickwir, Roanoke, Va. (June 17, p. 1568.)

NORTHWESTERN PACIFIC.—Contracts for building about 25 miles of line are to be let soon, it is said. This work is to be on the section from Shively, Cal., south towards Willits. (Dec. 24, p. 1261.)

OKLAHOMA-KANSAS ELECTRIC.—An officer writes that it is probable that work will be started soon on this line. The projected route is from Columbus, Kan., east to Galena, with a line running south via Baxter Springs to Sunnyside, Okla., and Lincolnville, thence west via Quapaw to Hattonville, and then south to Miami, about 36 miles. The line will connect the large lead and zinc mining districts of Kansas and Oklahoma with the smelters. There will be a 250-ft. steel bridge and another 100 ft. long, also a 4,000-ft. trestle. The company will also put up a car barn. Dr. Charles M. Jones, president; J. M. Cooper, vice-president; M. C. Harper, secretary and general manager, Baxter Springs, and W. K. Palmer Co., engineers, Kansas City, Mo.

ONTARIO & NORTHERN.—Incorporated in Wisconsin, with $75,000 capital, to build from Ontario, Wis., northeast to Wilton, eight miles. The directors include: V. A. Stottard, C. W. Lord, C. M. Sumdon, L. R. Walker, F. G. Bredlow, L. Wallace, H. Teasdale and others.

OTTAWA, RIDEAU VALLEY & BROCKVILLE.—According to press reports work is to be started this fall on the proposed line from a point near Ottawa, Ont., south to Brockville, about 60 miles. W. C. MacLaren, J. H. Gilmour, Brockville; E. W. Clarke, D. H. MacLean and G. H. Kidd, Ottawa; A. McDermott and R. E. Elliott, Montreal, are interested. (April 15, p. 1016.)

PEOPLES RAILWAY.—Bids are wanted up to July 15 by A. N. Warfield, Berlin, Ont., for clearing and grading 29 miles of railway, also for one 400-ft. bridge and the construction of five bridge piers. (See Supply Trade News.)

PRAIRIE FARM & SOUTHWESTERN.—The Wisconsin State Railroad Commission has granted this company a certificate of convenience and necessity to build from Prairie Farm, Wis., southwest to Emerald, 16 miles. Work is now under way. (June 10, p. 1438.)

ROSCOE, SNYDER & PACIFIC.—This company, operating a 49-mile line from Roscoe, Tex., northwest to Fluvanna, is to be extended southeast from Roscoe to Cross Plains, 75 miles. The Texas & Pacific, which connects with the line at Roscoe, is said to be financially interested in the project.

SAN ANTONIO, RIO GRANDE & TAMPICO.—An officer writes that work is now under way by the Harrison Construction Co., building from San Antonio, Tex., southwest to a point in La Salle county, about 90 miles. Track-laying is to be started soon. There will be five steel bridges, station buildings and coaling stations. G. W. Nock, chief engineer, San Antonio. (May 27, p. 1325.)

STATE LINE & SOUTHERN.—An officer writes that this company will be organized this month. The projected route is said to be from the Pennsylvania-Virginia state line south along the Monongahela river to Rivesville, W. Va. S. D. Brady, chief engineer, Fairmont.

TEXAS & PACIFIC.—See Roscoe, Snyder & Pacific.

WAYCROSS & SOUTHERN.—An officer writes that this road is now in operation from Waycross, Ga., south 10 miles. It is expected that the principal freight on the line will be lumber. J. W. Oakford, president, Scranton, Pa.

Railway Financial News.

CENTRAL OF NEW JERSEY.—White, Weld & Co., New York, offer for sale $300,000 of the Lehigh & Wilkesbarre Coal Company's consolidated mortgage gold 4 per cent. bonds guaranteed by the Central of New Jersey. These bonds mature in five, 10 and 15 years, and are offered at prices yielding 4.4 per cent.

CHICAGO, INDIANA & SOUTHERN.—See New York Central.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—See New York Central.

LAKE SHORE & MICHIGAN CENTRAL.—See New York Central.

LEHIGH VALLEY.—The stockholders at a meeting in Philadelphia this week approved an issue of $39,665,200 in new stock, as recommended by the directors on April 20. This will make the total stock of the company $80,000,000. The directors intend to issue at the present time only $20,220,550. President Thomas reviewed the improvement in the company's financial condition since 1903. During the first 10 months of the present fiscal year over $3,380,000 has been spent for new cars and engines and other improvements. Improvements now being made or authorized will aggregate $3,776,000. On September 1 second mortgage 7 per cent. bonds to the amount of $6,000,000 will be retired. Plans for the future embrace extensive additions to third and fourth tracks; additional terminals, and a low grade line for westbound anthracite coal from the mines to the main line. The stockholders of record June 30 may subscribe to the new stock at the rate of 50 per cent. of their present holdings.

MICHIGAN CENTRAL.—See New York Central.

NEW YORK CENTRAL.—Equipment trust certificates have been sold to J. P. Morgan & Co. to the amount of $22,500,000. These certificates bear interest at 4½ per cent. and mature serially, one-fifteenth of the entire issue on January 1 of each year. The agreement provides for the issuance of certificates to the amount of $30,000,000, representing 90 per cent. of the cost of the equipment pledged. The lines concerned have already ordered equipment costing approximately $26,465,000, distributed among the several companies as follows: New York Central, $4,583,833; Lake Shore, $13,152,210; Michigan Central, $4,785,859; Big Four, $2,627,853, and Chicago, Indiana & Southern, $1,318,076. The sale of these certificates will leave the several companies free to use capital which they have raised in other ways this year for miscellaneous improvements including the extension of third and fourth tracks on the West Shore and Lake Shore, the enlargement of yards at Buffalo, Rochester and other points, improvements and additions to block signals, additional roundhouses, large new machine and car shops for the Lake Shore and the Big Four, new passenger station at Rochester, etc. These notes are a part of the issue approved by the New York State Public Service Commission March 31. The certificates are issued by the Guaranty Trust Company as trustee. J. P. Morgan & Co., the First National Bank and the National City Bank are offering them at rates to yield over 4⅝ per cent. About half of the issue has already been disposed of.

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—Kuhn, Loeb & Co. and Speyer & Co. have sold all of the $4,000,000 in bonds of this company recently bought by them. (June 17, p. 1570.)

WABASH-PITTSBURGH TERMINAL.—A new committee of bondholders is being organized to represent bondholders who are identified with the movement started some weeks ago by the Colonial Trust Company of Pittsburgh to compel a reorganization more favorable to bondholders than that tentatively prepared by the commitee which has represented the first mortgage bondholders since the receiver was appointed two years ago. Most of the members of the new commitee have been selected. It is claimed that the holders of about $6,000,000 of the bonds deposited with the Central Trust have expressed their purpose to join with the new committee.

Supply Trade Section.

The Isthmian Canal Commission will ask bids until July 18 for deformed steel bars, manganese steel rings for rock-crusher screen, pneumatic hoist, gasolene motor and spud timbers. (Circular No. 591.)

The United States Electric Company, New York, announces that W. E. Harkness, who has been identified for a number of years with the Western Electric Company, New York, in the development of telephone train despatching, is now in the service of the U. S. E. Co. He will devote his attention to telephone, telegraph and selector equipment.

The American Railway Supply Company, 24 Park place, New York, has received an order from an automobile manufacturing concern for 128,000 brass tool checks. As far as Mr. Chur, general manager of the American Railway Supply Company, has been able to learn, this is the largest single order for goods of this kind ever given to any concern. It is certainly the record order for his company.

Tenders will be received until July 15, 1910, by A. N. Warfield, People's Railway, Berlin, Ontario, for the following material and equipment: Twenty-nine miles of railway ties, 29 miles of 70-lb. rails, 29 miles of railway spikes, 29 miles of railway track bolts, 29 miles of electric rail bonds, 50 miles of fence wire and gates, 50 miles of fence posts, 29 miles of grooved trolley wire, 29 miles of trolley messenger wire, 29 miles of telephone system.

Frederick W. Sivyer, president of the Northwestern Malleable Iron Co., Milwaukee, Wis., and vice-president of the Chain Belt Co., died on June 11 at his home in Milwaukee. Mr. Sivyer was born in Milwaukee on June 18, 1848, and began making his own living at the age of 14 years. In 1873 he entered the iron business, and after being connected with several prominent concerns, in 1882 he founded the Northwestern Malleable Iron Company. He took a great interest in the trade school movement and has done much for the welfare of Milwaukee's young men.

The General Railway Signal Company, Chicago, has appealed from the order of Judge Ray, of the U. S. circuit court, who, on June 8, granted an interlocutory injunction in favor of the Union Switch & Signal Co., restraining the General from manufacturing or using certain devices in connection with selective relays. The terms of the interlocutary injunction have been suspended pending decision of the case on appeal to the U. S. circuit court of appeals. The General claims that the Strubel patents are void because of anticipation, by prior devices, and that the patents of Young do not infringe in any way. It is claimed that the Young patents antedate those of Strubel, and in any case do not conflict. Owing to the intervention of the summer vacation and recess of the court arguments cannot be heard on the appeal before November next, until which time the interlocutory injunction is suspended.

The report of the Westinghouse Electric & Manufacturing Company for the year ended March 31 shows a rapid recovery from the financial difficulties that resulted in the appointment of receivers and the reorganization of two years ago. The net income for the year was $3,064,664. From the preceding year's operations a deficit of $918,000 resulted, so that an actual increase of $3,979,346 is shown in the year's net. The gross earnings were $29,248,682, an increase of $8,642,090. At the end of its fiscal year the company had unfilled orders on its books amounting to $11,256,197, not counting those of the subsidiary companies, while in April and May additional orders were booked aggregating $7,083,038, making a total of unfilled orders on hand May 31 of $13,000,000. At but one time in the company's history has the unfilled volume been greater. The operations of the Westinghouse Lamp Company, the Perkins Electric Switch Manufacturing Company, the Bryant Electric Company and R. D. Nuttal Company have been greatly expanded and their facilities will be increased. Since the close of the fiscal year $2,000,000 of the treasury funds have been appropriated toward the payment of that amount of the $6,000,000 notes maturing August 1, and arrangements have been completed for the extension of the remaining $4,000,000 of notes for a further period of three years. Through the payment of the $2,000,000 the funded debt of the company will have been reduced since the receivership $3,626,064 and the fixed annual charge reduced by more than $200,000.

Among the sales recently booked by the Crocker-Wheeler Company, Ampere, N. J., are the following: One 300-k.w. engine type generator for supplying light and power; The Barber-Coleman Co., of Illinois. One 150-k.w. engine type d.c. generator; L. A. Becker, of Illinois. One 350-k.w. engine type d.c. generator; Eberhardt-Faber Pencil Co., New York. One 150-h.p. d.c. motor; Columbia Chemical Co., of Ohio. Over 365 h.p. in d.c. motors; A. M. Beyer, of Pennsylvania. These motors will be used for operating rolls, presses, shears and a large variety of similar machinery in a pipe mill. Two 100-k.w. engine type d.c. generators and 190 h.p. in d.c. motors; Panola Cotton Oil Co. One 600-k.w. d.c. engine generator; Keystone Watch Case Co. One 250-k.w., d.c. engine type generator; Standard Gage Steel Co., of Pennsylvania. Over 225 h.p. in d.c. motors for operating packing machinery in the Jersey City plant of Swift & Co., New Jersey. One 100-h.p., d.c. motor; Penn Salt Co., of Pennsylvania. One 100-k.w. synchronous motor generator set; L. C. Smith & Bros. Typewriter Works Co., of New York. This set will be mounted directly on steel I-beams. One 250-k.v.a. engine type a.c. generator with one 14-k.w., 125-volt exciter; American Fork & Hoe Co., of Ohio. One 250-k.v.a. belt type a.c. generator; Western Canada Flour Mills Co., of Ontario. One 200-k.v.a. coupled type a.c. generator with a 9-k.w. exciter and two 200-k.v.a. 15,000-2 300-volt transformers; Sylacauga, Ala. One 250-k.v.a. belt type a.c. generator to be used for supplying power to induction motors; Michigan Buggy Co., Kalamazoo, Mich. Two 100 k.v.a., a.c. generators with an exciter; Hind & Harrison Plush Co., of New York. These machines will be driven by a DeLaval steam turbine.

TRADE PUBLICATIONS.

Locomotive Valve Gear.—The Pilliod Bros., Toledo, Ohio, have issued a booklet on the Pilliod valve gear containing drawings and description of this valve motion, which is described in full in this issue.

Track-Laying Machine.—The Hurley Track-Laying Machine Co., Chicago, has just issued a leaflet giving a number of pointers regarding the Hurley track-laying machine as an economizer of time, labor and motive power.

Alternators.—The Western Electric Co., New York, in bulletin No. 5,210, describes its new design of alternators for belt, engine and water wheel drive, with or without direct-connected exercisers. The illustrations show in detail the steps taken in building up the various parts of the alternators described.

Keweenaw Central.—The passenger department of the Keweenaw Central has issued a 16-page booklet on the rest, health and recreation to be found along the lines of that company. The historic peninsula is attractively described and illustrated. A large photograph of a relief map of the peninsula is also included.

Insulating Varnishes.—The Sterling Varnish Company, Pittsburgh, Pa., has just issued a small pamphlet describing its new Sterling elastic and Sterling extra elastic insulating varnishes. A piece of linen, coated with the extra elastic insulating varnish, accompanies the pamphlet. This sample is intended for testing the insulating qualities of this varnish.

Pulverizers and Crushers.—The Jeffrey Manufacturing Co., Columbus, Ohio, has just issued its catalogue No. 31 C covering Jeffrey crushers and pulverizers. The catalogue contains

a large number of illustrations showing these machines both assembled and disassembled. The latest models of Jeffrey swing hammer pulverizers are also shown in this connection.

RAILWAY STRUCTURES.

BERLIN, ONT.—See Peoples Railway under Railway Construction.

BRATTLEBORO, VT.—Residents of Brattleboro have been asked to appropriate $15,000 for abolishing grade crossings at Bridge street, in Brattleboro, and it is understood that the Public Service Commission of Vermont will contribute $12,500. It it said that the Central Vermont has agreed to build a station at a cost of $10,000 and make other improvements. The total cost of the work will be about $50,000.

CINCINNATI, OHIO.—Revised plans have been made for the Gilbert street viaduct, to be built from Eighth street and Broadway to Gilbert avenue and East Court street, in Cincinnati. The viaduct will have a total length of 1,179 ft. The new plans comprise a change in the design, material and construction. The viaduct is to be built of concrete. There will be a roadway 58 ft. wide, with 11-ft. sidewalks, and tracks for electric surface cars. The cost of the work is estimated at $700,000.

COLUMBUS, GA.—Bids are wanted by W. C. Campbell, superintendent of Public Works, Columbus, Ga., up to July 18, for building a concrete steel Melan arch over the Chattahoochee river, from Dillingham street to a point in Alabama. The structure will carry single-track for the operation of electric surface cars, and will cost about $125,000.

FORT WAYNE, IND.—The Pennsylvania Company is to take bids about August 1 for building a new passenger station. It is to be a three-story brick and stone building, estimated to cost $200,000. (March 18, 1910.)

An officer of the Wabash Railroad writes that the company will put up with its own forces a new bridge at Calhoun street in Fort Wayne. The plans call for a three-span bridge, each span to be about 21 ft., to carry four tracks, with I beams and solid concrete floor on steel bents and masonry abutments.

GREENSBURG, PA.—The Pennsylvania Company is taking bids for building a passenger station to cost about $150,000.

MONTREAL, CANADA.—A contract is said to have been given by the Canadian Pacific to the Foundation Company, Ltd., Montreal, for the pier work on the St. Lawrence river bridge. The Foundation Company is to lengthen the existing 15 piers to twice their present length, and will construct two new piers. The improvements are being carried out by the Canadian Pacific to place double tracks on the bridge.

ORANGEVILLE, MD.—The Northern Central has let the contract to Roberts & Schaefer, Chicago, for building a Holmen coaling station to cost about $45,000.

SAN ANTONIO, TEX.—See San Antonio, Rio Grande & Tampico under Railway Construction.

SAN FRANCISCO, CAL.—The Southern Pacific has filed a contract, made last month with the Missouri Valley Bridge & Iron Co. of Kansas, for putting in four concrete piers to support the new drawbridge across Sacramento river, between Sacramento and Broderick. The work must be finished by December 31. (Jan. 7, p. 71.)

VAN BUREN, ARK.—A combined highway and railway bridge is to be built over the Arkansas river on the line of Jefferson street by the Fort Smith-Van Buren district. There are to be nine spans of 196 ft., also a draw span. The substructure will be of concrete and the superstructure of steel, requiring about 4,227 tons of steel. There will be two tracks for electric cars and one track for steam railways. The total cost is estimated at $563,404. Contract for the foundation let to Kahmann & McMurry, Kansas City, Mo., and for the delivery and erection of the superstructure to the Arkansas Bridge Co., Fort Smith, Ark. The waterproofing material will be furnished by the Goheen Manufacturing Co., Canton, Ohio, and the paint will be furnished by the Patterson-Sargent Co., Cleveland, Ohio.

Late News.

The items in this column were received after the classified departments were closed.

An officer of the Chicago, Burlington & Quincy writes that a contract has been given to A. Guthrie & Co. for building a line from Scribner, Mont., to Fromberg.

The New York Central & Hudson River has given a contract to the Sundstrom & Stratton Co., New York, for work on 12 miles of double-track near Adams, N. Y.

The bill before Congress to require a uniform bill of lading, as asked for by the bankers, will go over until the next session, the Senate committee having decided to take no action on it.

The Gainesville, Oklahoma & Western expects to let contracts in about 30 days for building from Gainesville, Tex., southwest via Era, Slidell, Greenwood and Cowen to Bridgeport, about 56 miles. F. B. Truax, chief engineer, Gainesville. (June 10, p. 1437.)

The state railway commissions of Missouri and Kansas are preparing new tariffs of local freight rates, with a view to adjusting inequalities which have been produced by the change in interstate rates resulting from the recent order of the Interstate Commerce Commission, reducing rates from the East to Missouri river.

The Interstate Commerce Commission has granted a rehearing of the cases involving a reduction of sleeping car rates, but in so doing has sharply criticized the Pullman company for not submitting to the commission all of the facts. While a rehearing of the cases is granted, no stay in the order of the commission is allowed.

According to the *Pioneer Press* of St. Paul, which a week ago gave out large figures in connection with the dismissal of laborers on new railway work west and north of that city, all of the men discharged there were at once engaged by the roads east and south of St. Paul. These latter roads have begun extensive additions to their tracks, which are much needed, and they were glad to get these additional men.

The construction of the new bridge over the Monongahela river at West Brownsville Junction, Pa., by the Pennsylvania Railroad, has been deferred. The elevation of existing tracks and the construction of additional classification tracks in West Brownsville Junction Yard is being done by the company's men of the Monongahela division. None of the work is under contract. So much of the track work as can be done until the new river bridge is built is now nearing completion.

The Board of Conciliation which has been arbitrating differences in wages between the Grand Trunk and the Canadian Pacific railways and the conductors and trainmen employed on those roads, has awarded an increase of 25 per cent. in wages to date from May 1 last; but it is said that the leaders of the employees have refused to accept the award. They had asked for the rates prevailing in the United States, under which it is said the increase in Canada would be 40 per cent. instead of 25 per cent.

Count Zeppelin now promises to run airships regularly over a predetermined route, and to carry passengers; and he made his first trip on Tuesday of this week. It was from Friedrichshafen to Düsseldorf, 300 miles; time, nine hours. This was with the count's third mammoth dirigible balloon, the "Deutschland," and he carried 20 passengers. For a distance of 124 miles the speed was 41 miles an hour. The trip was begun at 3 o'clock a.m., and ended at noon. The route had been carefully marked out in advance and was followed exactly. The railway line between the cities named is roundabout, and between Mannheim and Düsseldorf, where the time of the railway trains is six hours, the balloon accomplished the trip in four hours. Fares by this airship line are to be from $25 to $50, and there will be a buffet aboard.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Central New England has ordered six Mogul locomotives from the American Locomotive Co.

The Youngstown & Ohio River has ordered one 85-ton Mikado locomotive from the Baldwin Locomotive Works.

Corrigan, McKinney & Co. have ordered one six-wheel switching locomotive from the American Locomotive Co.

The Louisiana Railway & Navigation Company has ordered two American type locomotives from the Baldwin Locomotive Works.

The Canadian General Development Co. has ordered one four-wheel saddle tank switching locomotive from the American Locomotive Co.

The McCrory & Beedeville Southern, Clayton Hailey, president, McCrory, Ark., a new line building through this state, is in the market for motive power.

The Canadian Western Lumber Co. is said to have ordered one six-coupled locomotive from the Baldwin Locomotive Works. This item is not confirmed.

The Temiskaming & Northern Ontario, as reported in the *Railway Age Gazette* of May 20, has ordered four Pacific locomotives from the Canadian Locomotive Co.

General Dimensions.

Weight on drivers	135,500 lbs.
Total weight	202,500 lbs.
Cylinders	21 in. x 28 in.
Diameter of drivers	69 in.
Type of boiler	Extended wagon top
Working steam pressure	200 lbs.
Heating surface, tubes	2,705 sq. ft.
" " firebox	162 "
" " total	2,867 "
Tubes, number	272
" outside diameter	2 in.
" length	19 ft.
Firebox, type	Wide
" length	95¼ in.
" width	69¼ in.
Grate area	46 sq. ft.
Water capacity	5,500 Imp. gals.
Coal capacity	10 tons

Special Equipment.

Axles	Nova Scotia Steel Co.'s o.-h. steel
Bell ringer	Chicago Pneumatic Tool Co.'s "Little Giant"
Boiler lagging	Magnesia—Carey's, 85 per cent.
Brakes	Westinghouse E. T. 6
Brake-beams	Simplex
Brake-shoes	Steel back
Brick arch	Supported on arch tubes
Couplers	Tower
Driving boxes	Cast steel
Headlight	Pyle-National, electric
Injector	Ohio No. 9
Journal bearings	Canadian Bronze Co.
Piston valves	Semi-plug, American Balance Valve Co.
Piston and valve rod packings	U. S. Metallic
Safety valves	Coales, muffled
Sanding devices	Wilson pneumatic
Sight-feed lubricators	Detroit bullseye
Springs	Montreal Steel Co.
Staying	Radial—Monkbridge staybolt iron
Steam gages	Jas. Morrison, Toronto
Steam heat equipment	Gold
Tires	Midvale
Truck and tender	Schoen steel
Tubes	"Kerosa" steel
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The People's Railway, A. N. Warfield, Berlin, Ont., Canada, will receive bids until July 15, 1910, for a number of car bodies and trucks.

The Illinois Central has issued inquiries for two observation-parlor, two passenger-baggage, two café-coach and two café-parlor cars.

The Litchfield & Madison is taking prices on 200 tight bottom and 200 drop bottom gondolas. The cars will be all steel and of 50 tons capacity.

The McCrory & Beedeville Southern, Clayton Hailey, president, McCrory, Ark., a new line building through this state, is in the market for rolling stock.

The Cudahy Oil Tank Line, reported in the *Railway Age Gazette* of June 10 as having ordered 10 all-steel tank cars, gave this order to the German-American Car Co.

The Temiskaming & Northern Ontario, as reported in the *Railway Age Gazette* of May 20, has ordered 12 Otis steel, drop bottom cinder cars and 50 steel underframe box cars from the Canadian Car & Foundry Co. The cinder cars will have a capacity of 40 tons and will weigh 39,500 lbs. They will be 36 ft. 9½ in. long, 9 ft. 6 in. wide, 3 ft. 10 in. high, inside measurements, and 39 ft. 10 in. long, 10 ft. ½ in. wide, 8 ft. 2 1/8 in. high, over all. The box cars will have a capacity of 40 tons and will weigh 40,500 lbs. They will be 36 ft. long, 8 ft. 6 in. wide, 8 ft. high, inside measurements, and 37 ft. 9½ in. long, 9 ft. 10⅜ in. wide, 14 ft. 6 in. high, over all. The special equipment includes:

Axles	Nova Scotia Steel Co.
Bolsters, truck	Simplex
Brakes	Westinghouse
Brake-beams	Simplex
Brake-shoes	Steel back
Brasses	Canadian Bronze Co.
Couplers	Tower
Draft gear	Miner
Dust guards	Harrison
Journal boxes	McCord
Paint	Graphite
Side bearings	Susemihl
Uncoupling levers	Acme
Wheels	Cast iron

The box cars will have Chicago Winslow corrugated iron roofs and arch bar trucks.

MACHINERY AND TOOLS.

The Canadian Northern is in the market for a list of 28 machine tools, including drills, presses, lathes, a power hack saw, emery wheel stands and punch and shears.

The United States Steel Corporation has ordered from the Allis-Chalmers Co., Milwaukee, Wis., six gas-engine-driven electrical units for its Gary, Ind., power plant. The Allis-Chalmers Co. has already installed 25 engines in this plant, and with the addition of the six just ordered the combined capacity will be raised to 150,000 h.p., making this the largest power plant of its kind in the world. These units will operate on blast furnace gas.

IRON AND STEEL.

The Elgin, Joliet & Eastern has ordered 200 tons of bridge steel from the American Bridge Co.

The Atchison, Topeka & Santa Fe has ordered 1,200 tons of bridge steel from the American Bridge Co.

The Chicago & North Western has ordered 1,350 tons of structural steel for shop buildings from the American Bridge Co.

The Canadian Pacific has ordered 10,000 tons of bridge steel from the American Bridge Co. for a bridge over the St. Lawrence river.

The Southern has ordered from the McClintic-Marshall Construction Co. 300 tons of structural steel for a boiler shop at Spencer, S. C.

The Pennsylvania has ordered from Lewis F. Shoemaker & Company 300 tons of structural steel for two small bridges at Greenville, Pa.

The Missouri, Kansas & Texas has ordered 1,300 tons of structural steel from the American Bridge Co. for its new freight house at St. Louis, Mo.

The Kentucky & Indiana Bridge & Railroad Company has ordered 15,000 tons of bridge steel from the American Bridge Co. for a bridge at Louisville, Ky.

General Conditions in Steel.—Reports indicate a good demand for steel bars and plates, and that orders for structural material have been fair during the week. The railways have been doing some little buying in rails, but car and locomotive orders have practically ceased, which condition, however, is usual for this time of the year. The steel mills of the country can be kept fairly well employed on present unfilled orders for some time to come, but unless there is an increase in new business in July and August operations will be on a reduced scale.

Low Tension Portable Testing Outfit.

A small portable testing outfit, which the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., has recently developed, is shown herewith. There are continual